COAL AGE

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"DO not look a gift horse in the mouth." Why? He usually has bad teeth.

Time was when nearly every position of responsibility carried with it certain perquisites, but with the gradual moral awakening in our business conscience, perquisites have fallen into disfavor, until now it requires an elastic conscience to accept most of them.

Every now and then, however, you'll run across some man in authority who is willing to accept without question the old adage about the "gift horse," and when you do, it is better not to suggest that his conscience is elastic. In this class must be placed those individuals who are willing to stand sponsor for any new organization, provided they see a "gift horse" in the distance.

Here are a few illustrations of what they sow:—

A fake "building and loan association" (there are plenty of them still in existence) was organized in a certain city which was centrally located in an important mining region. How were they to get the miners' money? Easy—they gave stock to a number of the more prominent mine superintendents and foremen, afterwards displaying the names of these men on all of their advertising circulars.

During the two succeeding years, a large number of thrifty miners followed the lead (as they supposed) of their bosses, and invested all of their savings in building-and-loan stock. In the meantime, the officials gradually became worried about the "teeth" displayed by their "gift horses;" however, the time to examine a horse's teeth is when the other fellow owns it. When the inevitable crash came, everything disappeared—except the "gift horses'" teeth; they will undoubtedly survive their masters.

In another mining town a fake industrial insurance company was started, and the same tactics were resorted to, with almost similar results. In still other communities, fake land companies, fake co-operative mining companies, fake orchard companies, fake banks, etc., were organized simultaneously, and after drifting on the customary two years, traveled the same road and shut up shop.

Don't think for a minute that large companies are the only ones that profit by the so-called "pull of prominent names." You'll find the book agents, picture agents and salesmen of all descriptions offering their wares free to ministers and other prominent people, just to get their list started. We have even known raffles to "hang fire" until the "super" accepted several numbers free and allowed his name to be artistically engraved on the sellers' lists.

You see, "gift horses" are grown in all sizes from ponies to draft horses, and serve all ages of humanity from children to the aged and infirm. In one respect, however, there is not much variation, and that is as regards teeth.

"But," says the pessimist, "everyone knows the proverb about 'a fool and his money.' Why try to protect him?" And we answer: There is not so much inclination on our part to guard the foolish and gullible as there is a desire to awaken the moral conscience of the near-owners of the "gift horses."

The most conspicuous example of discipleship to "gift horses" now in the public eye, is the prominent son of one of our most gifted authors. Whatever may be the outcome of his trial as affects himself, the incident is bringing home to all mining men the realization of the responsibility of guarding well one's name.

A man can no longer loan the use of his name to an unsafe business enterprise and hope to be held blameless afterwards if the venture brings disaster. Declarations of personal ignorance concerning the true character of the undertaking will not exonerate one. The only argument left to such a man is to defend his action on the basis of conviction that one of the perquisites of leadership is reward without responsibility.

The "gift horse" and the perquisite may not lay claim to the same identical pedigree, but they never refuse to eat from the same manger.

MORAL: Do look a "gift horse" in the mouth.

IDEAS AND SUGGESTIONS

The Fallacy of Seven Shifts a Week

By a Colorado Engineer

Any engineer or superintendent of machinery, for a large coal operation with several mines, can call to mind times without number when he has made hurry trips to a mine because some new piece of machinery "wouldn't work," or some newly installed drive "went backwards." Upon his arrival, he probably found that some little thing had been neglected, by the local force in the erection, or that some easily remediable defect existed, that took only a small amount of work and gray matter to cure. The same men can also recall that they swore at the apparent stupidity of the mine machinist or master

The stupidity was only apparent. The fact is that the local force had been working on that installation three or four shifts straight, and some of them, doubtless, for weeks previous, putting in eight to twelve shifts a week, until they couldn't be expected to have any ideas.

Furthermore, the local machinist, when physically fit, has almost, if not quite, as good ideas as the man who came down from the city office to set him straight. The conditions under which he works, however, are such as to absolutely benumb his brain and make original thought impossible. Such a run of extra shifts on the part of monthly men is often made a matter of loyalty to the company, but is mistaken loyalty at that. On the part of men paid by the hour it piles up the payroll without commensurate service. In either case the company loses.

Even seven shifts a week is one too many for the best work. Men get logy and give no more service than they would in six. Such conditions are more common in the West than in the older parts of the country, and the men themselves are largely responsible.

I myself worked on one construction job for fifteen months, seven days a week. I observed many of the men insisted on working on Sundays and would have quit had it not been permitted. The work would have gone slower on a six-day schedule, not because the men would work any slower, but because it would have been difficult to keep men on the job. The payroll was just one-sixth bigger than it would have been for the same work on a six-days-a-week basis. The company lost by working that seventh shift.

Where the Harm Is Done

Coal mines seldom run on Sunday, but certain men work almost every Sunday necessarily because machinery is idle and can be gone over for repairs. These same men frequently put in extra shifts during the week, and I never knew one of them to lay off a regular shift to catch up. That is where the harm is done. Physically they stand up under it, but mentally they are benumbed and in a position where they are incapable of keen intelligence and originality. The company loses rather than makes by such continual service.

Again, life in many camps has no distractions, except the saloon. Some men, ambitious and earnest, not caring for these attractions, live, eat and sleep with the job. It may be good for the job, but it is bad for the men. The man who has no outside interest, no recreation, begins to think in a circle, to lose perspective. The soft-handed office chap, who forgets his work at five o'clock, can come down to the mine and with a fresh mind, see and solve problems that have baffled the mind, naturally as strong, but clogged by unnatural living.

Would not companies be ahead by insisting that no man put in more than seven shifts a week, or if he does, making him lay off during the next to even up? In camps which the companies control, they should provide amusement places, aside from the saloon, not merely educational features, but billards and bowling, and moving-picture theaters. These things need not be given, they simply need to be permitted. They will pay for themselves as they do in independent communities not controlled by corporations.

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The Danger in Efficiency Methods

By Pennsylvania Reader

In coal mining, as in all other industries, a large proportion of the companies have as their higher officials men who have not passed through every stage of the business before assuming their present position.

Thus by far the majority of presidents of coal-producing corporations are not men who have spent a considerable portion of their early life actually digging coal or driving a mule or picking slate. Very often they are the choice of the board of directors on account of their general executive and administrative ability. Sometimes they hold their position simply because they have the confidence of a majority of the stockholders and have average business ability. The same condition holds true with the general manager and superintendent. They, more often, are technically trained men; their actual experience in coal mining has probably been confined to more or less desultory chaining done on an engineer corps during summer vacations while at school.

When we get to the mine foreman we almost invariably find a so called practical man who has laboriously gone through all the various stages of mining up to his present position. He has mastered sufficient arithmetic, geometry, etc., etc., to enable him to discharge his duties intelligently. But his main "stock-in-trade" is not his book knowledge or the various theories which have been propounded to him. He is valuable to his employer on

account of his good common sense and judgment, his ability to handle men, and various other qualities which can be obtained at least as easily in the school of practice as anywhere else.

There are, of course, many presidents, managers and superintendents who have literally worked their way up from the bottom, but these are exceptional cases. The men who have thus succeeded have had unusual ability.

In the present day, when the daily papers, the so called muck-raking magazines, and reports of investigation committees are full of arguments for industrial efficiency, it is no more than natural that the directors of the coal industry should concern themselves with the improvement of the business over which they preside by introducing scientific management.

The first step in this process is to systematize the business completely. The manager requires numerous reports from his superintendents in order that he can point out to the latter where room for improvement exists. The superintendent, in turn, must have facts and figures on which to base his reports, so he calls on his subordinates to furnish him with daily statements. The most available man to turn to for these reports is the mine foreman, and it is just at this point that often more is lost than gained by trying to introduce modern efficiency systems.

It is always difficult to make a practical man see the advantages of any change in the established methods and the average mine foreman is no exception to this rule. The new reports he is required to make are considered by him as a mere waste of time, so that he does this part of his work half-heartedly and he is not so much concerned with accuracy as he is with getting the task out of the way.

But besides this apathy or even opposition on the part of the mine foreman, there is another more serious objection to this system of getting at efficiency figures. The mine foreman is the "man at the front." He is the man who personally directs and leads his men. The labor of which he has charge is of such a nature that it is necessary in most cases for the foreman not merely to give directions to his men as to how the work is to be carried out from day to day but, if he is to be successful, he must actually *see* the work done. This, of course, means that he must visit widely scattered points.

He may be called upon during the course of the day to see that a fall in a main haulageway is cleaned up and made safe, or that a roadway is repaired or that better ventilation is provided in a certain part of the mine or that hundreds of other jobs are duly performed. He may have men who are responsible to him for overseeing these various jobs, but after all a mine never was a success unless the "big boss" devoted a large proportion of his time to supervising the work in person.

It may happen that the foreman is conscientious and truly aims to give his superintendent the information, the latter demands. We must remember that the mine boss is a self-educated man and cannot get down to any clerical work, such as is needed in making out formal reports, without his attention being taken from his regular duties, much to the detriment of the latter.

I do not mean to infer from the above that modern efficiency should not and cannot be applied to coal mining. But under the present existing conditions, with inferior grades of labor and strong overbearing pit committees, modern efficiency methods cannot start with the mine foreman. They must be initiated lower down the scale, with the diggers and daymen themselves. The modern mine foreman has not the ability nor leisure to train his men, especially when radical changes in the method of work are demanded in the interests of modern efficiency methods.

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How Accidents May Be Reduced

By Joseph Northover*

Out of 490 persons killed in the mines of Pennsylvania during the year 1911, 308 met death from falls of coal, draw slate and roof rock. Thus 62.86 per cent. of the fatal accidents were caused by falls.

Systematic timbering and spragging at the working face will do much to reduce this type of fatalities. The question of when and where sprags or props should be set is one which should not be left entirely to the judgment of the individual miner. While he should be free to put up additional props when he thinks they are needed, he should not be permitted to set them more than a fixed distance apart. Experience shows that a large proportion of accidents occur from falls of apparently strong roof, in which no crevice or slip could previously be observed. Hence the roof, sides and working face can be made secure, only by timbering systematically.

The assistant foreman should not have any larger section than he can cover each and every day. No more than 75 men should be under his supervision. There should be a few special rules printed on cards in the various languages and hung in conspicuous places in the mine.

When the assistant mine foreman visits a working place and finds any workman violating the rules as set down by the company, such workman should be promptly suspended by the mine foreman for days, weeks or months, according to the nature of the rule violated.

The rules posted might be somewhat as follows:

Rule I. When undermining coal, set sprags not less than 7 ft. apart.

Rule II. Examine your working place at the beginning of every shift before you start to work.

Rule III. There shall be not less than 4 rows of props in all rooms. These shall be not more than 4½ ft. apart, and the foremost props must be set not more than 7 ft. from face.

Rule IV. Do not charge even a rock hole with both dynamite and powder.

Rule V. When you fire a blast in coal or rock, wait at least 3 min. before going to see what the shot has done.

It would be the duty of the assistant foreman to see that these rules were strictly enforced.

*Assistant foreman, Berwind-White Coal Mining Co., Seanor, Penn.

SNAP SHOTS IN COAL MINING

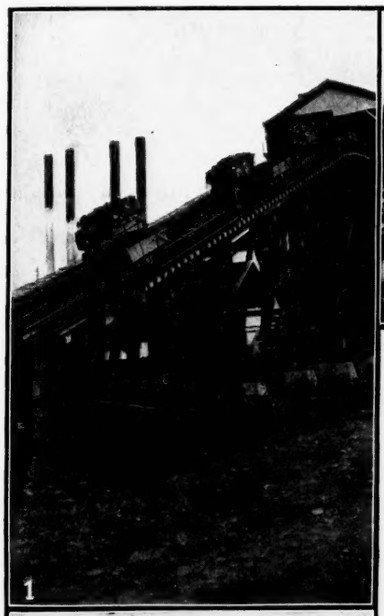
1—Concrete portal of the Willow Creek mine, Utah Fuel Co., Utah. A mine opened in 1912. Note the heavy rails for the electric locomotives.

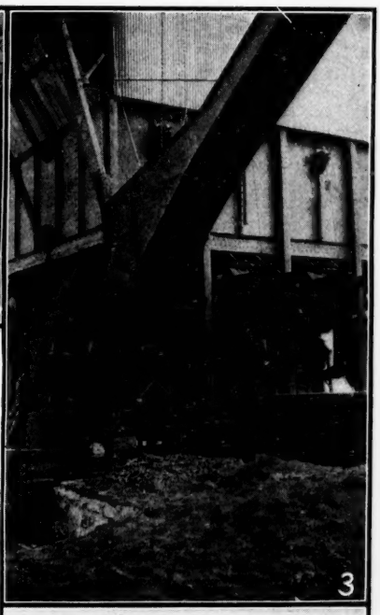
2—Village of Monarch, Wyo., where the mines of the Wyoming Coal Mining Co. are located. Most of the houses are one story high.

3—Ziegler District Colliery Co.'s Shaft North No. 1, Christopher, Ill.

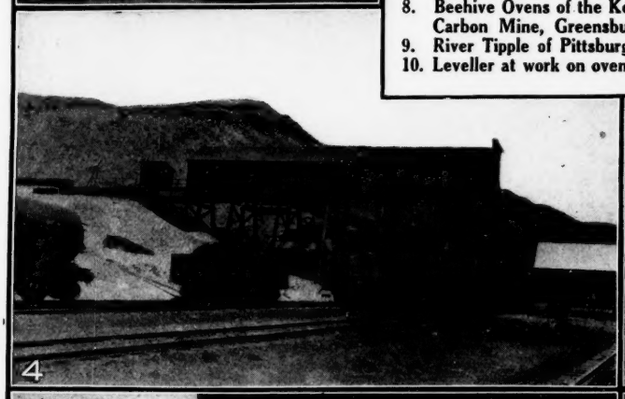
4—Roundup Coal Mining Co.'s Tipple at Roundup, Mont.

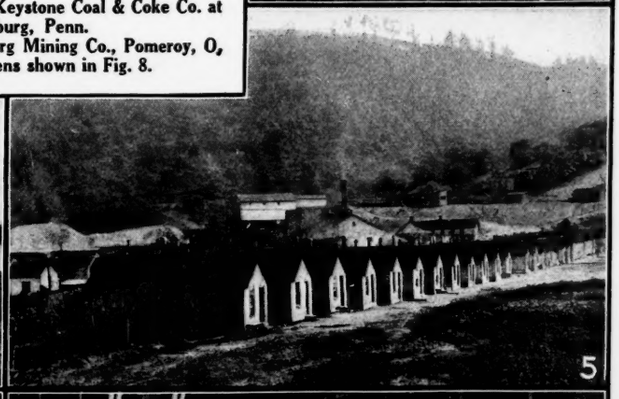
5—Headframe and Tipple at Galt Mine No. 6, Lethbridge, Alberta, Can., owned by the Canadian Pacific Ry.

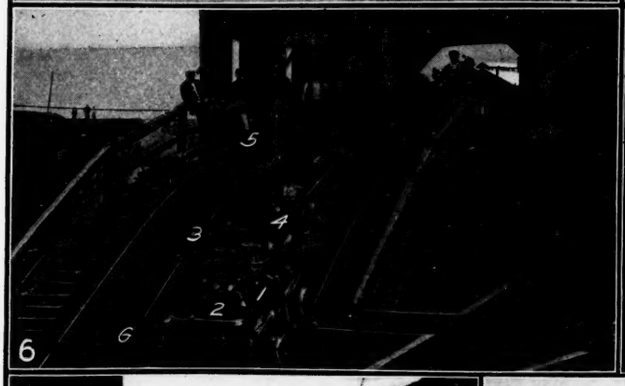


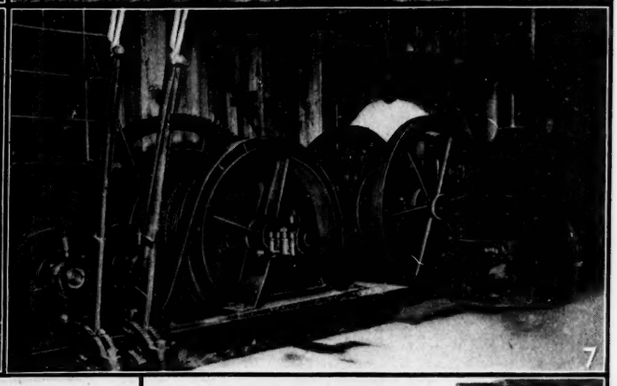


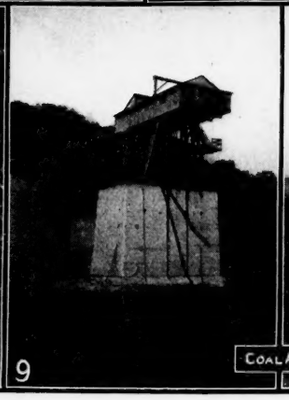
1. Car-haul at the Carney Coal Co.'s Mine at Carneyville, Wyo. Erected by Roberts & Schaefer.
2. Tipple of the Hutchinson Coal Co., at Bridgeport, O.
3. A tipple belonging to the Wyoming Coal Co.
4. Van Dyke Tipple of Central Coal & Coke Co.
5. Lorain Coal & Dock Co.'s 35-year old houses at Wheeling Creek, O.
6. Head of Short Mountain Slope, Lykens, Penn. (1) R. A. Quinn, general manager; (2) W. Auman; (3) M. Readdy; (4) C. P Kutzner; (5) C. N. Finton; (6) J. Reese.
7. Gasoline Hoist at Ratcliff Coal Co.'s Mine, Douds-Leondo, Iowa.
8. Beehive Ovens of the Keystone Coal & Coke Co. at Carbon Mine, Greensburg, Penn.
9. River Tipple of Pittsburg Mining Co., Pomeroy, O,
10. Leveller at work on ovens shown in Fig. 8.

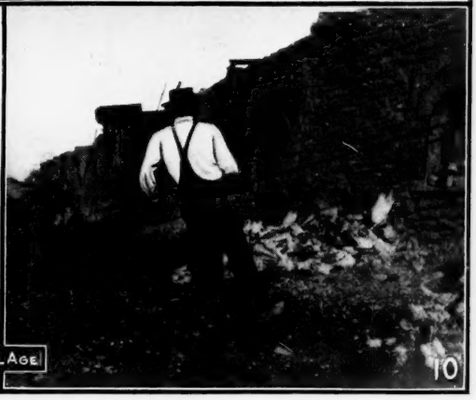












The Preparation of Bituminous Coal

By F. E. Brackett*

SYNOPSIS—This is the first of two articles on this subject. The different types of car-dumping devices are discussed, as well as the track grades, both approaching and leading from them. The slopes of bar screens and chutes for handling the various sizes of coal are also considered.

The preparation of bituminous coal for market is one of the simple problems of mining engineering. At least the process itself is simple, but it is often quite difficult to decide just what series of operations to adopt, or just how far to carry them. The present article will be confined more particularly to the engineering aspect of the business and attempt to give data of interest to those who may be called upon to lay out mine plants.

What Is Coal Preparation?

In a general sense coal preparation consists of cleaning from impurities and in sizing over screens. The first is usually carried out in the mine and in the tipple or dumphouse. The subject of washing is a specialty in itself and will not be considered here.

Such cleaning as coal otherwise receives is simply the picking out of impurities. The screening is generally done at the tipple, although coal can be "forked" in the mine.

For the present purpose we recognize two main classes —steam coals and gas coals. In physical texture the first are softer and more brittle than the latter. They produce less smoke and have a higher calorific value. On burning, the slack coal cokes quickly, forming a cover over the fire, which is easily broken with a slice bar, thus allowing a full draught through the fuel.

Slack is, therefore, nearly as good as lump coal among fuels of this class. The brittle nature and coking qualities of steam coals make sizing on screens both less effective and less important than for gas coals. We, therefore, seldom find screening carried on to any considerable extent with this class.

With gas coals, however, the conditions are quite the reverse. Their hard texture and slower coking qualities make screening advisable, and in some sections of the country where competition is strong, we find this sizing carried out with great care.

Coal is nearly always cleaned underground. Above all things the miner must be required to load a clean product. Any other policy would much increase the work at the surface and decrease the efficiency of the plant. Usually the only other attempt made at cleaning is carried out in the railroad cars. From one to several men placed there to watch the coal as it is dumped can ordinarily catch all the dirt which has passed the miner. Sometimes picking belts are installed, as in the anthracite mines, but their use has, in some cases, been found superfluous. They are not usual nor in any sense common features of bituminous plants.

The smaller grades of coal are sometimes washed for market. In coking plants the entire output is sometimes crushed and washed to remove the sulphur, and thus improve the grade of coke.

*Consulting engineer, Cumberland, Md.

It is usually thought proper to dump coal but once after it has been loaded by the miner. Thus in nearly all cases we find the mine cars brought to the surface, even though in shaft and slope mines this is sometimes quite inconvenient where large outputs are to be obtained.

It would seem that too much stress had been laid on this point. Much coal is handled eight times before it reaches the grate bars, as follows: First, from breast to mine cars; second, to railroad cars; third, to barge; fourth, to crane bucket; fifth, to storage bin; sixth, to carts; seventh, to boiler-room floor, and eighth, to grate bars. Sometimes even this schedule might be increased.

Again, the rehandling after the coal has been shipped is often much rougher than any received at the mine. For these reasons we think the colliery owner would be justified in dumping his coal from mine cars to skip, monitor or other contrivance, if he finds it convenient to do so.

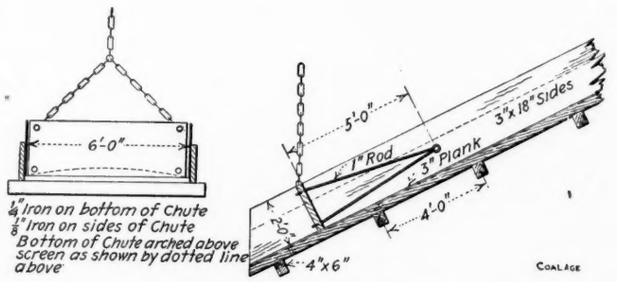


Fig. 1. A Gate Which Can Be Easily Opened or Closed

Moreover, it might be feasible by special designs to drop the coal from the skip to the railroad car more gently than it is possible to load direct from the mine car. The use of "baskets" on tipples to break the fall is a recognized advantage, but from some cause or other the use of a skip is not looked on favorably, though for reasons just given this would seem to be nothing more than a mere prejudice.

The Different Kinds of Dumps

Contrivances for dumping coal from the mine cars may be classified under three heads: bottom dumps, cradle dumps and end dumps, or tipples. These all possess their peculiar advantages, but the latter is by far the most common in ordinary use.

Gates are sometimes placed in the bottoms of mine cars, where they are to be dumped into long bins at different points. Gear equipped in this way can be discharged at any point on a track where an opening is provided, and hence for bins this is convenient. "Rope trips" can be dumped in this way without uncoupling the cable.

As bins are a necessity at coke plants and many railroad coaling stations, this method of dumping is frequently found useful. Bins can also be loaded by putting the ordinary end dump on a truck and moving same to various points, where a car is to be emptied. This, however, is tedious for a large bin and output.

Cradle dumps turn the pit wagons sideways and require no gate in the car. The form is that of a large open cylinder, in which one or more cars are placed. This cylinder slowly revolves and thus discharges the car's contents.

For loading railroad cars this arrangement has been found too slow and cumbersome for general use, but for filling bins it might prove useful, especially where several cars would be emptied at once. Like the bottom dump, it might be arranged to accommodate a rope trip without uncoupling, but for a long trip this would no doubt be too cumbersome. It is probable that the coal is deposited more gently with contrivances of this class than with any other type.

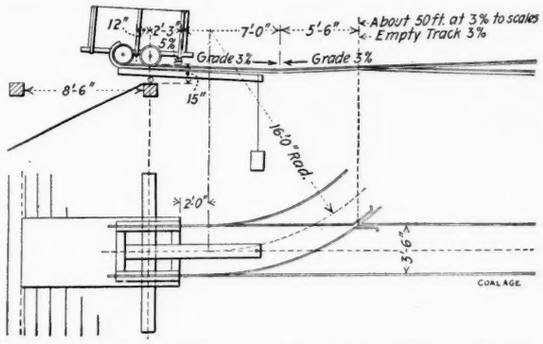


FIG. 2. A HALF TIPPLE, SHOWING TRACK GRADES

For ordinary commercial purposes—loading railroad cars—we find the end dump or tipple almost universal. This is on account of its small size, low cost and rapidity. There are a number of different types of this tipple on the market, but most of them can be classified as either "half tipples" or "through tipples."

Fig. 2 shows an efficient and cheap device of a type which since the introduction of the "through tipples" has come to be known as a "half tipple," because the car must be pulled or moves automatically backward after dumping, instead of going on through.

By arranging the grades as shown, the empty car leaves the tipple of its own accord after discharge, but sufficient momentum must exist in the car to carry it uphill to the tipple from the low point, which is 7 ft. in rear of the mechanism.

This momentum is provided by allowing about 50 ft. of a downhill run from the mine scales, as indicated. In actual practice three cars per minute have been dumped with this tipple, but delays due to non-arrival of trips, and other miscellaneous causes, much decreased this as a daily average.

Fig. 3 shows a through tipple. After being dumped, the car travels over the tipple and around the "kickback" at *B*. The "horns" which hold the car on the table while it is being dumped are opened by the action, through a special mechanism, of the next car fed to the dump. This arrangement somewhat reduces the labor requisite to the use of the half tipple and slightly increases the speed of dumping. About four cars per minute can be handled, provided there are no delays in feeding.

It is frequently claimed that this speed can be increased, though for ordinary practice it is very doubtful whether it can be materially augmented. Certainly not, if the coal is passed over a bar screen in the chute below the tipple. In fact, to screen properly this speed should be reduced a little for two-ton mine cars. There is usually far more delay in getting cars to the tipple than there is in actual dumping.

NECESSARY TRACK GRADES

The grades or slopes of the tracks below the tipple and around the "kickback" should be carefully laid out so as to prevent the empty car from attaining too great a velocity, but at the same time to make its movement prompt and certain.

To accomplish this, it would seem that the empty track grade g should not exceed 2 per cent., and that the total slope b, existing at the center of the tipple, should be between 0.0265 and 0.0320 ft., according to the amount of resistance to be encountered. For cases where there is no unusual friction, the lower value might be used, but practice usually sanctions a little higher grade. In a case where there are two extra switches, besides the one at the "kickback" to cross, and where the distance between the tracks is double width (about 16 ft.), the factor used should not be less than 0.0320.

After leaving the mine car, the coal enters the chute. If no screening is done, this is only a means of conveying the coal to the transportation car and performs no function except to break the fall and assist in trimming, so as to give the loaded car a pleasing appearance. Under these conditions the shorter the chute the better.

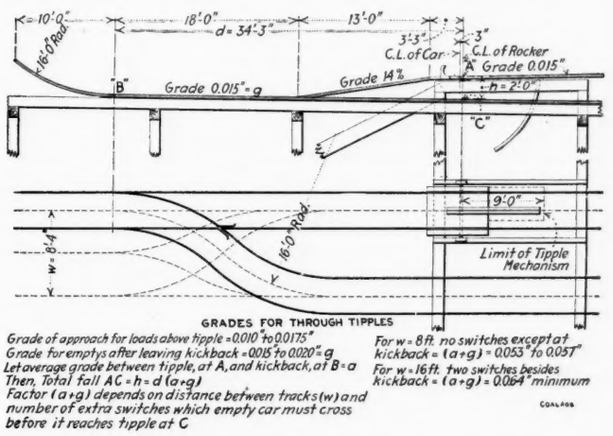

10'-0" Rad.
16'-0" Rad.
18'-0"
d = 34'-3"
13'-0"
3'-3"
3"
C.L. of Car
C.L. of Rocker
A
Grade 0.015"
h = 2'-0"
B
Grade 0.015" = g
Grade 14%
C
9'-0"
16'-0" Rad.
8'-4"
Limit of Tipple Mechanism
GRADES FOR THROUGH TIPPLES
Grade of approach for loads above tipple = 0.010" to 0.0175"
Grade for empties after leaving kickback = 0.015" to 0.020" = g
Let average grade between tipple, at A, and kickback, at B = a
Then, Total fall AC = h = d (a+g)
Factor (a+g) depends on distance between tracks (w) and number of extra switches which empty car must cross before it reaches tipple at C
For w = 8 ft. no switches except at kickback = (a+g) = 0.053" to 0.057"
For w = 16 ft. two switches besides kickback = (a+g) = 0.064" minimum
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FIG. 3. A THROUGH TIPPLE AND KICKBACK

When a screen is used in the chute, this usually consists of a number of bars placed longitudinally, over which the coal passes. That portion of the chute above the screen should be long enough to spread the coal over the entire width, but not so long as to unduly increase its velocity. Sometimes this part of the chute is arched slightly on the bottom, as shown by the dotted line in Fig. 1. This materially assists in spreading the coal.

Except for an apron to aid in trimming the cars, the part of the chute below the screen can scarcely be said to perform a function, unless the coal is stopped at its lower end.

The dimensions of coal chutes no doubt are largely fixed by the capacity of the mine cars. However, with the standardization of equipment the dimensions of chutes for lump and run-of-mine coal have been quite generally fixed at 6 ft. wide and 18 in. to 2 ft. deep where screens are used. Where there are no screens, the

chutes are often made narrower and sometimes taper slightly toward the lower end. Four feet is a common width for the extremity or lip.

The narrower end assists greatly in trimming when the length of the chute lies the long way of the railroad car. By this arrangement, the best trim on the car is accomplished. Where conveyors and revolving screens are employed, the fine-coal chutes are often from 12 in. to 18 in. wide.

From 5 to 8 ft. length of chute is usually required above the screen to spread the coal. About 10 ft. of a 6-ft. chute is enough to hold, say, 2 tons of coal, or the capacity of an ordinary mine car. This, then, is about the proper length of chute below the screen. Where chutes are made of wood, lined with sheet iron, the bottoms should be covered with ¼-in. plate, while the sides may be ⅛ in. in thickness.

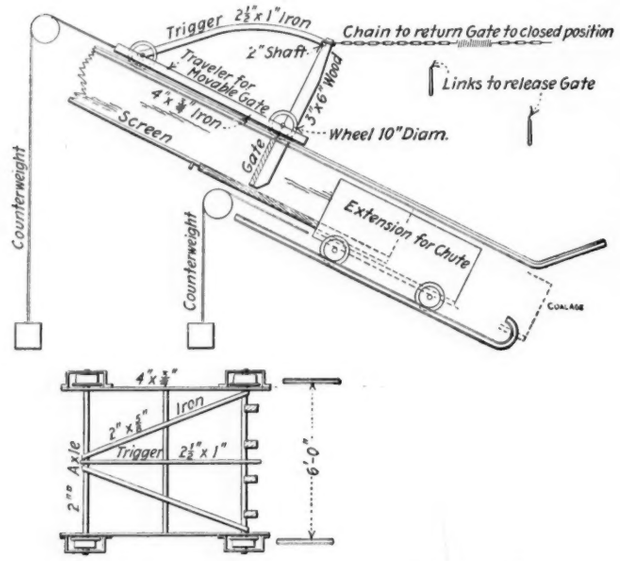


FIG. 4. A SLIDING GATE OR "MONKEY"

If the chute is a short one, the slope is not of great consequence so long as it is enough. As a rule, 25 degrees will be found sufficiently steep for steam coals. With long chutes, such as are required with screening arrangements, care should be taken to get enough slope to move the coal slowly along, but not enough to raise the velocity too high.

The following pitches have been found by trial to be about right. Some variation, however, exists between different regions. Slope or sump chutes and screens require from 5 in. to 6 in. per foot. Four and one-half inches (20°—33′) can be used for very hard, bright coals. This pitch will sometimes fail to start coal which has been stopped in the chute, even when the lining has worn bright. Nut coal will run on 6 in. per ft. or a slope of 26°—34′. The screens, however, should be pitched 8 in., or 10 in. per ft., and the chutes a little steeper than 6 in. Pea screens require about 10 in. per ft., and pea chutes at least 8 in. Slack chutes should incline 12 in. per ft., or 45 degrees.

RETARDATION NEAR END OF CHUTE

Coal is often retarded or brought to a complete standstill in the chute at the lower end, in order to permit a more thorough cleaning or for the purpose of weighing. Where the chutes are long, the coal is nearly always thus retarded, because its speed would break up the lumps too much were it allowed to enter the railroad car without check of some kind. There are various ways of stopping the coal, but the gate "monkey" and pan are the most common. A brief description will therefore not be out of place here.

Fig. 1 represents a gate of convenient form, which is easily opened and closed, and coal can be fed out at any speed necessary for a thorough inspection and cleaning. As a check on the velocity, however, it acts a little too late. The coal has already attained considerable speed, and some breakage may be expected.

The sliding gate or "monkey," Fig. 4, was designed to correct this trouble. The illustration shows an iron truck carrying the end gate for the chute. This truck is counterbalanced and controlled by a brake and a positive clutch (not shown), which holds it in its upper position. Both of these are operated through levers by the tipple man.

The weight of coal against the gate causes it to slide down the chute, until the trigger catches one of the wrought-iron loops placed for that purpose. This frees the gate, which automatically opens and releases the coal. The counterweight then returns the truck to its upper position.

The gate itself is closed by the tightening of the chain, which is fastened to the upper part of the gate frame near the point where the trigger catches it. The figure also shows an extension formed by another truck. This is a rather uncommon form of apron.

A Queer Fuel

In this country, where we have coal, wood and gas, in abundance, people hardly give the heating question a thought. But in South Africa, where there is very little fuel of any kind, they are compelled to look to other sources for their fuel. In parts of Cape Colony, it is a common sight to see little boys, ranging over the fields with a sack, picking up dried cattle dung.

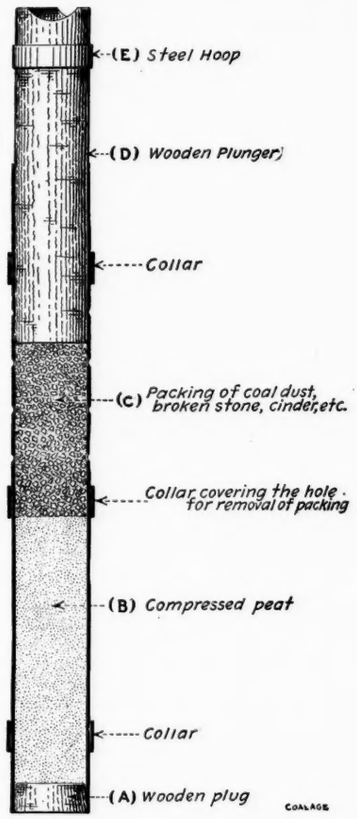
In fact this is the principal fuel supply. The farmers herd their cattle in a kraal at night, for months at a time, until their droppings have reached a thickness of several feet, and are, of course, trampled down very hard. When it is the required thickness, it is cut into square blocks and corded, very much as we cord wood in this country. When sufficiently dry it is ready for use. It lights easily and gives off considerable heat, but soon burns out, and must be replenished frequently.

Where a hillside storage of anthracite is desired, the engineer should select a slope about 300 ft. wide and 1000 ft. long, with a pitch of at least 25 deg. which ends in a level area, large enough to accommodate the desired number of tracks. If such conditions are not obtainable the expense of much digging and filling-in will have to be considered. The topography of the immediate neighborhood should be such as to permit the laying of a track, with a fair grade to the top of the storage hill and down on the other side, at a moderate cost. With this method of storage, rescreening is easy. The cost of maintenance, however, is high, as the hillside must be either concreted, paved or planked in order to insure clean coal. The cost of installing this type of plant averages $1.60 per ton of capacity, and where the hill is paved or concreted the cost is somewhat higher. The operating cost is estimated to be 10c. per ton. The percentage of breakage is high.

Metal Mine Posts

Some metal sets of the Nellen system, shown herewith, have been placed for experimental purposes at the Wérister mine, Belgium.

Each post consists of a metal sleeve of 4.8 in. diameter, split lengthwise into two parts, which are fastened together by three split collars. This sleeve is closed at the bottom with a wooden plug *A*. In it are placed one or two cylinders of compressed peat *B*, then some packing *C*, composed of coal dust, pieces of stone, cinders, etc., reaching to a point about 12 in. from the top.



When Pressure Comes on This Post it Telescopes, the Shortening Action Being Resisted by Compression of Peat

Above is inserted a wooden plunger *D* about 28 in. high, with a steel hoop *E*. The elevation of the plunger is regulated by abstracting a sufficient quantity of the packing through holes in the tube. The rail serving as a crossbar rests on the plungers of the two posts, which are held in place under it by iron shoes *F*, fastened to its base by pressure screws.

Post Gives Approximately Equal Resistance Under Unequal Subsidence

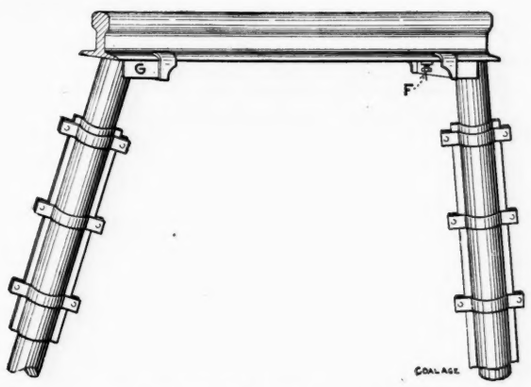
To take up the effect of the thrust, there is placed between the plunger top and the shoe, a block of compressed peat *G*. The holes in the sleeve permit the removal of packing material when the pressure is too great, thus avoiding a distortion of the frame and preserving more or less elasticity.

Unlike wooden timbers, which break, the Nellen metal posts are in this way regulated so that they give a constant support to the roof. Experiments tend to show that they resist the first pressure well. Sometimes, under its action, the sleeves tend to open, in which case more split collars are placed on them.

M. Dessard, director of the Wérister colliery, figures the cost of a metal set in place at $12.75, which compares with $1.78 for a timber set. The cost of putting up the metal set is increased by the difficulty in handling the heavy parts. Each post weighs about 103 and the crossrail about 158 lb. Furthermore, the assemblage of the parts requires some skill and takes more time than ordinary timbering.

In spite of the higher cost of the metal frame, M. Dessard thinks that its use will be economical in galleries of long life, where otherwise several successive repairs or renewals might be anticipated, due either to the pressure of the roof or deterioration of the timber.

In consequence of their being of greater size than metal supports, all-wood sets require that the galleries be made larger if an equal passage way is desired. Metal sets save about 4 or 8 in. in width and 2 in. in height. They may generally be placed farther apart than the wooden sets. Even if spaced at the same distance as wooden supports, a saving results, as, in general, intermediate timbers have to be used after the first timber sets become injured. Each replacement of the timbers in a gallery represents a cost of labor and material of about $4 per running foot.



A Three-piece Set on Nellen System, Which "Gives under Pressure" and Does Not Break

In case the galleries are abandoned, the metal post may usually be removed at little expense and used over again. It may be added that the galleries thus equipped should be easier to keep amply open. The general hygiene and safety of the workings cannot be other than improved by the use of these posts, which are likely to be adopted in all collieries where the management looks beyond first cost. The Wérister colliery proposes to use more of these sets in the future.

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It may almost be said that good discipline in the mine will do more to reduce death rates than any discovery scientists are likely to make. The highest technical skill at the command of industry becomes inoperative where discipline is at a discount. In the same way mine rules and regulations are useless if they are not observed.

Note—Report of M. Beaupain in the Annales des Mines de Belgique Tome XVII, 1911. Translated by E. P. Buffet for Coal Age.

Statistics on Coal Mine Fatalities

By F. L. Hoffman*

SYNOPSIS—A brief review of coal-mine accidents during the last decade, 1902 to 1911, together with a short summary of the fatal accidents for the last thirty years, 1882-1911. It is shown that the death rate per 1000 men employed is less for 1912 than for the previous year.

The annual tabulation of coal-mine fatalities for North America is a difficult and discouraging task. It is practically impossible to obtain all returns for the several coal-mining states within a reasonable period of time after the close of the year for which the information is required. As an inevitable result, the data are deprived of the highest attainable degree of practical utility.

I first commenced the tabulation of coal-mine fatalities in 1897, at the request of the late editor of the *Engineering and Mining Journal*, Richard P. Rothwell. Since the field was new, many difficulties were met with, and these have not passed away during the intervening years. Apparently some of the coal-mine inspectors are indifferent to the requests made to them for information, and in other states the law prevents the publicity of the required facts previous to the publication of the official report.

The establishment of the Federal Bureau of Mines has done something to improve matters and it is to be hoped that the bureau will succeed in establishing a well equipped statistical service, and publish in the future quarterly reports on mine accidents in much the same manner as this has been done for some years by the Interstate Commerce Commission.

There are other urgent needs for reforms in the statistics of coal-mine fatalities. It requires no discussion to sustain the conclusion that trustworthy information regarding coal-mine fatalities is a matter of considerable practical importance to the coal-mining industry. The value of the returns is in proportion to their inherent trustworthiness and comparability.

It may be seriously questioned whether, under present methods, the average number of men employed is always determined by precisely the same method, and it may be suggested that an understanding should be arrived at by all of the coal-mining states to make use of standardized methods, not only as regards the calculation of fatality rates, but also as regards many important statistical details, which at present are not available. This suggestion applies to the causes of accidents, the time of their occurrence, the age, race, nationality and precise occupation of the employed, and the killed or injured, as the case may be.

Many accidents also occur in which there is no loss of life or serious injury. The reports for the several states do not at present show the number of accidents as distinct from the number of persons killed or injured. A

TABLE I—NUMBER OF PERSONS KILLED IN THE COAL MINES OF NORTH AMERICA, 1902—1911.

	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1902-1911
Alabama	50	57	84	185	96	154	108	129	238	209	1310
Colorado	73	40	89	60	88	99	61	99	319	85	1013
Illinois	99	156	157	199	155	165	183	213	406	157	1890
Indiana	24	55	34	47	31	53	45	50	51	35	425
Iowa	55	21	31	24	37	35	38	28	39	36	344
Kansas	30	36	16(a)	36	30	52	31	35	25	42	333
Kentucky	19	25	19	31	40	32	40	33	84	41	364
Maryland	11	16	12	16	13	5	12	19	17	13	134
Michigan	6	8	7	8	6	7	6	9	6	7	70
Missouri	10	17	11	11	16(b)	8(a)	10	21	16	8	128
Montana	12	5	9	8	13	14	21	12	13	7	114
New Mexico	17	17	15	5	9	31	34	18	14	15	175
Ohio	81	124	118	114	126	153	112	115	162	109	1214
Oklahoma	60	33	30	44	39	32	44	23(b)	46	29	380
Pennsylvania Anthracite	300	518	595	644	557	708	678	567	601	699	5867
Pennsylvania Bituminous	456	402	536	479	477	806	572	506	539	515	5288
Tennessee	226	26	28	29	33	31	34	31	38	111	587
Utah	8	7	9	7	7	8	8	16	15	16	101
Washington	34	25	31	13	21	37	25	39	43	37	305
West Virginia	120	159	140	194	269	356	625	364	320	332	2879
British Columbia	139	42	37	12	15	31	18	57	28	16	395
Nova Scotia	19	31	19	20	28	35	39	33	31	36	291
Total	1849	1820	2027	2186	2106	2852	2744	2417	3051	2555	23607

(a) Six months only. (b) Eight months only.

TABLE II. FATAL ACCIDENTS IN THE COAL MINES OF NORTH AMERICA, 1902—1911.

Rate of Persons Killed per 1000 Employed.

	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1902—1911
Alabama	2.79	2.94	4.77	10.75	5.23	7.61	5.75	6.40	10.81	9.20	6.74
Colorado	8.11	3.89	8.26	5.05	7.32	7.67	4.25	7.53	21.60	5.94	8.20
Illinois	2.15	3.13	2.87	3.36	2.49	2.47	2.58	2.93	5.44	2.03	2.98
Indiana	1.83	3.64	1.91	2.63	1.58	2.79	2.36	2.64	2.41	1.68	2.33
Iowa	4.23	1.59	1.90	1.36	2.20	2.05	2.20	1.56	2.17	2.13	2.09
Kansas	3.22	3.61	3.09(a)	2.97	2.95	4.35	2.74	2.83	2.26	3.56	3.16
Kentucky	1.58	1.85	1.37	2.06	2.39	1.82	2.15	1.76	3.97	1.78	2.14
Maryland	1.89	2.82	2.11	2.57	2.10	0.85	2.00	3.34	2.93	2.17	2.27
Michigan	4.24	2.54	2.58	2.16	2.83	2.43	1.94	3.04	2.43	2.74	2.59
Missouri	1.09	1.85	1.09	1.06	1.65(b)	1.70(a)	1.06	2.31	1.55	0.80	1.39
Montana	6.19	2.32	3.59	3.67	5.43	5.12	6.68	3.11	3.16	1.81	3.94
New Mexico	10.11	7.26	7.61	2.35	3.82	10.13	9.26	5.57	4.89	4.21	6.51
Ohio	2.16	3.00	2.57	2.58	2.71	3.20	2.23	2.45	3.32	2.25	2.65
Oklahoma	9.62	5.42	3.63	5.76	4.81	4.15	3.02	2.78(b)	5.43	3.54	4.55
Pennsylvania Anthracite	2.03	3.41	3.69	3.83	3.35	4.19	3.89	3.31	3.57	4.03	3.55
Pennsylvania Bituminous	3.36	2.65	3.44	2.90	2.76	4.40	3.15	2.72	2.79	2.82	3.10
Tennessee	25.80	2.69	2.81	2.76	3.07	2.79	3.06	2.62	3.40	10.37	5.56
Utah	3.24	3.21	4.06	3.57	3.69	3.07	2.99	5.36	4.38	4.21	3.85
Washington	7.83	5.13	6.69	2.61	4.08	6.05	4.68	6.81	7.15	6.18	5.74
West Virginia	3.41	4.03	3.08	3.88	5.20	6.33	10.35	5.85	5.00	4.90	5.46
British Columbia	34.65	9.85	8.31	2.72	3.12	5.12	2.95	8.88	3.61	2.33	7.16
Nova Scotia	2.36	2.79	1.63	1.86	2.31	2.89	3.02	2.73	2.82	2.87	2.54
Average	3.48	3.16	3.33	3.40	3.20	4.15	3.84	3.39	4.18	3.48	3.58

(a) Six months only. (b) Eight months only.

*Statistician, Prudential Insurance Co., Newark, N. J.

further defect is the absence of a precise definition as to what constitutes a fatal, a serious, or a minor injury. Some time limitation must be agreed upon to make the fatalities strictly comparable for the several states. It occasionally occurs that death follows a serious injury many months after its occurrence.

For practical statistical purposes it would probably be advisable to consider all serious injuries fatal which are terminated by death within seven days of their occurrence.

All these matters require careful consideration, and no

TABLE III.—FATAL ACCIDENTS IN THE COAL MINES OF NORTH AMERICA.

Comparison of 1911 with 1906-1910.

	Number of persons killed Yearly average. 1906—1910	1911	Rate per 1000 employed 1906—1910	1911	Increase or decrease of Rate
Alabama	145	209	7.28	9.20	+1.92
Colorado	134	85	9.91	5.94	—3.97
Illinois	225	157	3.23	2.03	—1.20
Indiana	46	35	2.35	1.68	—0.67
Iowa	36	36	2.03	2.13	+0.10
Kansas	35	42	3.04	3.56	+0.52
Kentucky	46	41	2.47	1.78	—0.69
Maryland	13	13	2.23	2.17	—0.06
Michigan	7	7	2.51	2.74	+0.23
Missouri	14	8	1.64	0.80	—0.84
Montana	15	7	4.49	1.81	—2.68
New Mexico	21	15	6.99	4.21	—2.78
Ohio	134	109	2.78	2.25	—0.53
Oklahoma	37	29	3.91	3.54	—0.37
Penn. Anthracite	622	699	3.67	4.03	+0.36
Penn. Bituminous	580	515	3.16	2.82	—0.34
Tennessee	33	111	2.99	10.37	+7.38
Utah	11	16	3.97	4.21	+0.24
Washington	33	37	5.82	6.18	+0.36
West Virginia	387	332	6.56	4.90	—1.66
British Columbia	30	16	4.79	2.33	—2.46
Nova Scotia	33	36	2.76	2.87	+0.11
Average	2634	2555	3.76	3.48	—0.28

authority is in a better position to bring about the required reforms than the Federal Bureau of Mines. Its preliminary tabulation of accidents marks a promising beginning, and it is to be hoped that, in course of time, the statistical aspects of the accident problem will receive more extended consideration.

Granting a considerable degree of inherent trustworthiness to the valuable data regarding fatal accidents in coal mines, it must be admitted that the returns regarding serious and nonserious injuries are often worthless. From the point of view of employers' liability and workmen's compensation, however, the nonfatal injuries are of much greater importance than those which are terminated by death.

According to the statistics of compensation, and of proceedings under the Workmen's Compensation Act of 1906, for the year 1910, the financial consequences of mine accidents in the United Kingdom were as follows: There were 1347 fatal cases, costing companies £222,973 ($1,085,098) in compensation; the number of nonfatal cases was 166,709, for which £818,302 ($3,982,267) was paid. In addition, compensation was required to be paid to persons employed in mines on account of 3783 cases of industrial disease, to the amount of £42,507 ($206,860).

In the course of time, when the doctrine of liability for industrial diseases shall become more firmly established and enlarged, it is practically certain that compensation on this account will reach a much more impressive figure. The data are merely referred to as an illustration of the practical utility of trustworthy accident statistics, including nonfatal injuries, precisely defined, according to the nature of the injury, the part of the body injured, and the consequent duration of disablement as measured by incapacity for work.

After delaying the present discussion for several months on account of the difficulties briefly referred to at the outset, I have found it necessary to include the returns for three states as furnished by the preliminary report of the Federal Bureau of Mines. I have done so with reluctance, since the returns may be subject to future correction, but I have not been able to secure the required information from the state inspectors of mines of the three states. I only refer to these difficulties to make it clear that the long delay in publication is not my own fault or due to indifference on the part of the large majority of state inspectors of mines, who have been most courteous and prompt in furnishing the desired information.

According to the present tabulation, the number of fatal accidents in the coal mines of North America during 1911 was 2555, or 496 less than the number of fatalities during the previous year. Since the number of persons employed in mining was slightly higher, the fatality rate decreased to 3.48 per 1000 during 1911, against 4.18 in 1910. Table I gives in detail the number of fatal accidents in the principal coal-mining states of North America for each year since 1902, and a similar statement for the decade ending with 1911. Much to my regret, the returns for some of the smaller coal-mining states could not be included, particularly Alaska, Arkansas, North Dakota, Texas and Virginia.

This table shows that the largest number of fatalities (699) during 1911 occurred in the anthracite mines of Pennsylvania, followed by 515 deaths in the bituminous mines of that state, and 332 deaths in the coal mines of West Virginia.

TABLE IV.—THIRTY-YEAR RECORD OF THE FATAL ACCIDENTS IN THE COAL MINES OF NORTH AMERICA, 1882—1911.

	Number of Employees	Number Killed	Rate per 1000 Employed
1882	151,737	412	2.72
1883	188,519	585	3.10
1884	203,504	594	2.92
1885	214,184	576	2.69
1886	222,029	514	2.32
1887	230,834	514	2.23
1888	278,175	659	2.37
1889	278,361	681	2.45
1890	301,295	853	2.83
1891	326,684	959	2.94
1892	343,564	883	2.57
1893	384,249	970	2.52
1894	394,146	962	2.44
1895	404,553	1061	2.62
1896	409,320	1123	2.74
1897	409,830	956	2.33
1898	407,536	1056	2.59
1899	421,489	1250	2.97
1900	464,237	1507	3.25
1901	494,287	1586	3.21
1902	530,624	1849	3.48
1903	576,365	1820	3.16
1904	609,001	2027	3.33
1905	643,225	2186	3.40
1906	658,880	2106	3.20
1907	686,460	2852	4.15
1908	715,355	2744	3.84
1909	712,550	2417	3.39
1910	730,707	3051	4.18
1911	733,144	2555	3.48
1882—86	979,973	2681	2.74
1887—91	1,415,349	3666	2.59
1892—96	1,935,832	4999	2.58
1897—01	2,197,377	6355	2.89
1902—06	3,018,095	9988	3.31
1907—11	3,578,216	13619	3.81
1882—1911	13,124,842	41308	3.15

The highest fatality rate during 1911 was 10.37 per 1000 employed, and this rate was for the state of Tennessee. This excess in the fatality rate was due largely to an explosion at Briceville, which involved a loss of 84 lives. Second to Tennessee in this respect is the state of Alabama, where the figures reached 9.20 per 1000, due largely to an explosion at the Banner mine, which caused a loss of 128 lives. The rates in detail for each state, and for each year of the decade ending with 1911, as well as for the North American coal field as a whole, are given in Table II.

According to this table the average fatality rate in coal mining in North America during the decade ending with 1911 was 3.48 per 1000 men employed. The rate attained its maximum during 1910, when it was 4.18 per 1000, and its minimum in 1903, when it was 3.16. Comparing the rate for 1911 with the rate for 1910, it is shown that there was a decrease of 0.70 per cent.

If the 1910 rate had prevailed in 1911 there would have been 510 more lives lost than was actually the case The reduction in the rate may safely be considered a gratifying evidence that improved methods of mining, the introduction of safety devices, rescue work, etc., are beginning to show results, but this cannot be entirely credited to the causes stated.

Comparing the fatality rates for 1911 with the average for the preceding five years, it appears that the rates increased in Alabama, Iowa, Kansas, Michigan, Pennsylvania (anthracite), Tennessee, Utah, Washington and Nova Scotia. This evidence of an increase in the rates of representative mining states is in itself conclusive proof that as yet the effect of improved methods of mining, the introduction of safety devices, rescue work, etc., is considerably below what might reasonably be expected. Only those who are thoroughly familiar with the underlying causes of mine accidents can fully appreciate the practical difficulties which will have to be overcome so as to bring about a material reduction in the fatality rate.

The problem will only be solved by radical improvements in mining methods, and most of all by the gradual development of a strict sense of discipline on the part of all mine employees, including the supervising officials themselves. Model mine conditions cannot be of much value as long as mine workers and mine officials continue to disregard rules and regulations, or wilfully incur risks which involve the safety of others as well as of those who are foolhardy enough to imperil themselves.

The details of changes in the fatality rates for the several states are given in Table III.

In continuation of the fatality record for previous years, I include Table IV, for a 30-year period, with a convenient summary of the returns by five-year periods. It will be noted that the decrease in the rate for 1911 did not materially change the average for the last five years, which exceeds considerably the average for the preceding 25 years of coal-mining operations in North America. The average fatality rate during this long period has been 3.15 per 1000 men employed. This rate, without question, is at least 50 per cent. in excess of that obtainable under safer mining methods with a mining population more obedient to rational rules and regulations making for safety in mine work.

Considering that the rate includes both inside and outside employees, it requires no argument to emphasize the conclusion that the rate, without doubt, represents conditions much better than they actually are. If only underground workers had been considered, the rate would probably have been not far from 5 per 1000 during the last decade.

Since the average age of coal miners in North America is probably not much over 33 years, when the normal death rate is about 9.5 per 1000, it is obvious that on account of the risk in coal-mining operations the mortality of this class of wage earners is probably increased about 50 per cent. It would, therefore, seem that much more public attention should be given to the question of accident prevention than to the subject of employers' liability and workmen's compensation.

TABLE V.—LIST OF MINING ACCIDENTS IN GERMANY DURING THE LAST 46 YEARS, 1867—1912.

Year.	Name of the Mine.	Number of Deaths.
1867.	Fundgrube Sachsen	101
1869.	Iserlohn, Ruhrrevier	101
1869.	Burgker-Schaechte, Sachsen	268
1876.	Neu-Iserlohn, Ruhrrevier	33
1876.	Karlingen, Lothringen	147
1876.	Borussia, Ruhrrevier	15
1879.	Brueckenberg-Schaechte, Sachsen	89
1881.	Luisen-Tiefbau, Ruhrrevier	17
1882.	Pluto, Ruhrrevier	62
1883.	Massener-Tiefbau, Ruhrrevier	16
1884.	Shamrock, Ruhrrevier	16
1884.	Viktor, Ruhrrevier	12
1885.	Osterfeld, Ruhrrevier	12
1886.	Konsolidation II, Ruhrrevier	56
1887.	Hibernia, Ruhrrevier	52
1887.	Gneisenau, Ruhrrevier	15
1889.	Konstantin, Ruhrrevier	14
1889.	Erin, Ruhrrevier	12
1891.	Hibernia, Ruhrrevier	54
1893.	Kaiserstuhl, Ruhrrevier	63
1893.	General Blumenthal, Ruhrrevier	20
1893.	Koenig Ludwig, Ruhrrevier	10
1894.	Camphausen, Saarrevier	181
1895.	Prinz von Preussen, Ruhrrevier	37
1896.	General Blumenthal, Ruhrrevier	36
1896.	Kleophas-Grube, Oberschlesien	30
1897.	Oberhausen I and II, Ruhrrevier	10
1897.	Kaiserstuhl II, Ruhrrevier	20
1897.	Frankenholz, Pfalz	44
1898.	Zollern, Ruhrrevier	45
1898.	Karolinengluecк, Ruhrrevier	119
1901.	Koenig Ludwig, Ruhrrevier	10
1901.	Konsolidation, Ruhrrevier	18
1902.	Carolinengluecк, Westfalen	119
1903.	Konenigin-Luisen-Grube, Oberschlesien	30
1905.	Borussia, Ruhrrevier	39
1907.	Reden, Saarrevier	148
1907.	Klein-Rosseln, Saarrevier	73
1907.	Mathildenschacht, Saarrevier	22
1908.	Radbold, Ruhrrevier	360
1908.	Didweiler, Saarrevier	15
1910.	Siegfried, Mitteldeutschland	17
1912.	Osterfeld, Ruhrrevier	16
1912.	Lothringen, Ruhrrevier	110

The following is a brief list of the accidents in the United States, involving the loss of five or more lives during 1911, arranged in the order of their occurrence:

1911		No. killed
Jan. 20	Gayton Mines, Richmond, Va	5
Jan. 25	Hughestown No. 10, Pittston, Pa., Penna. Coal Co	6
Feb. 9	Cokedale Mine, Trinidad, Colo., American Smelting and Refining Company	9
March 18	Mine No. 16, West Mineral, Kan., M., K. & T. Ry	6
April 7	Pancoast Mine, Throop, Pa	73
April 8	Banner Mine, Birmingham, Ala	128
April 24	Ott Mine No. 20, Elk Garden, W. Va., Davis Coal & Coke Co	10
July 15	Sykesville, Pa., Cascade Coal & Coke Co	21
Oct. 25	O'Gara Mine No. 9, Harrisburg, Ill	8
Nov. 9	Adrian Mine, Punxsutawney, Pa., Rochester & Pittsburg C. I. Co	8
Nov. 18	Vivian, W. Va., Bottom Creek Coal & Coke Co	18
Dec. 9	Cross Mountain Mine, Briceville, Tenn., Knoxville Iron Co	84

Table V is derived from German sources, and shows the more serious mine accidents throughout Germany since 1867.

During 1911 the number of deaths in disasters causing a loss of 10 lives or more was 334. It is self-evident, therefore, that the chief consideration is not the disaster which attracts national or even international attention, but the daily loss of life, due to falls of roof, mine cars and other causes more or less preventable, provided mine workers and supervising officials coöperate and work persistently toward this desired end.

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Danger from shotfiring may be greatly reduced by observing the following points: (1) If possible use an electric battery for shotfiring. The handles should be detachable and the cable at least 20 yd. long. (2) Examine all working places carefully before firing. If possible remove gas and dust if present. (3) Keep all detonators in a locked can. After removing one, relock the can. (4) Never shoot from the solid. All under cutting should be at least 66 in. deeper than the shot hole. (5) Use only just enough powder to do the work where the coal is full of slips and breaks. (6) Never tamp with coal dust. (7) Remove all powder before firing. (8) Use a copper scraper and a wooden rammer. (9) Only fire one shot at a time.

Development of Coal Cutting Machinery

By Thomas W. Fry*

SYNOPSIS—This article describes briefly the inception and development of the continuous undercutting machine from the first type employing a revolving cutter-bar and cleaner-chain to the modern design, which will operate either right or left handed and is driven by a motor entirely inclosed in a flame-proof case.

For the purpose of undercutting coal, two types of machines had been developed in this country up to about 1885. These were the reciprocating or pick machine, driven by compressed air, and the breast machine, driven either by compressed air or electricity. As compared with hand work, the advent of these types mark a decided advance in the art or process of mining coal.

The reciprocating machine, or puncher, as it is commonly called, is practically the power operated equivalent of the miner's hand pick—virtually a pick engine mounted on wheels. Naturally it is much more powerful and cuts faster than by hand. It is built in various sizes, which are well designed, durable and efficient.

This type of machine will work in coal, which, owing to impurities such as sulphur and rock, cannot be economically cut by some of the other types. It is small and inexpensive in first cost, but owing to its relatively less cutting capacity compared with the larger and more powerful machines of other types, the expense of operation in labor and power per ton of coal produced is higher.

Its principal limitation is that its successful operation depends upon the skill, strength and continuous effort of the runner since it must be guided and controlled by the hands and feet, and each blow which is delivered must be placed effectively.

The Breast Machine

The breast machine substitutes for the reciprocating pick a gang of teeth or cutters, which are moved against the face of the coal, scraping or raking it from the solid. In the earlier types the cutters were inserted in a rotating bar, mounted at the front end of the machine, and as this bar was forced under the coal at right angles to the face, the bits cut a kurf equal in height to the diameter of the circle in which they rotated.

In the later machines, however, the rotating cutter-bar was dispensed with and the bits inserted in the links of an endless chain, which traveled in a horizontal plane. In this type the cutters operate only while crossing the machine at its forward end, being pushed ahead meanwhile under the coal.

Generally speaking, breast machines are more continuous in their operation than punchers, since they make an undercut, say, 3 ft. wide and 6 ft. deep, ordinarily without stopping. They are held to their work by jacks and fed forward by power instead of being guided and controlled by the strength and skill of the operator.

Both pick and breast machines make undercuts about 3 ft. and 5 ft. wide, respectively, and from 5 ft. to 7 ft. in depth. On the completion of these cuts, the machine must be moved with more or less difficulty and loss of cutting time to a position adjacent to the incision already made. This frequently involves the removal and replacement of posts for supporting the roof close to the face of the coal.

It is evident from the above that there is great advantage in a machine which, after its first undercut at one side of the room is made, will cut continuously without interruption clear across the face. Such a machine is not only more efficient in cutting capacity, but also leaves a cleaner bottom.

Continuous Coal Cutters

Development work on cutters of the continuously operating type was begun in the early Eighties and they were placed upon the market a few years later. Fig. 1 shows a top view of such a machine as built by the Diamond Prospecting Co., of Chicago, now the Sullivan Machinery Co. It will be noted that like all of the

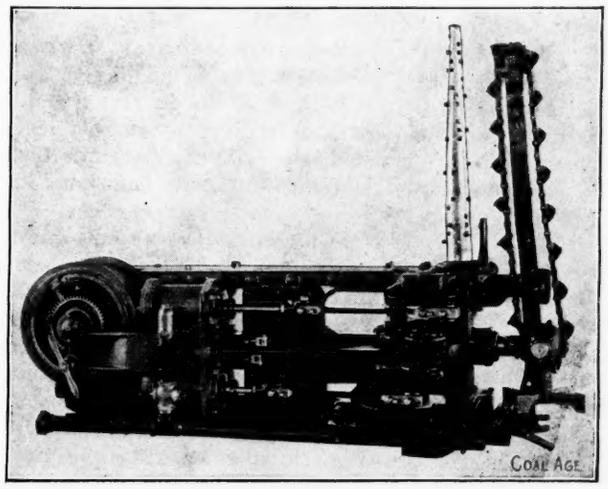


Fig. 1. Top View of First Continuous Coal Cutter

machines of that period, the cutter-bar was of the rotating type with inserted bits.

The machine was operated by compressed-air engines geared to the cutter-bar and to a drum furnished with a wire rope, the free end of which was attached to a jack set close to the face of the coal in advance of the machine. The entire mechanism could, therefore, be pulled along by means of this rope and drum.

To keep the machine close to the face, it was either mounted on rails or attached to a heavily weighted car, which was supported on sharp edged disks or wheels which sunk into the bottom and resisted the outward thrust of the cutter-bar, which tended to force the machine away from its work. The illustration also shows the cleaner chain following the cutter-bar and provided with scrapers to clean the cuttings out of the kurf.

This machine was also provided with jacks for raising it on one side or the other, thus keeping the cutter bar down close to the bottom or raising it to pass over rocks or other impurities.

*Claremont, N. H.

The Improvements Made

Various improvements in this type of machine have been made from time to time. The first and most important of which was doubtless the substitution of the endless chain for the revolving cutter-bar. Another was the employment of a cable chain instead of the wire feed rope. The chain is not only more convenient to handle than the rope, but embodies a principle which was a pioneer invention in the method of guiding or steering the machine while at work.

The feed chain is fastened to a jack at the side of the room, extends along the face to a sprocket on the forward end of the machine body, thence to sprockets at the rear of the machine, and then to a jack at the opposite side of the room.

By tightening or loosening the chain between the machine and the rear jack, the angle of the bar supporting the cutter-chain can be varied with relation to the face of the coal, thus permitting the machine to follow irregularities therein.

Then, too, by advancing the end of the bar in the direction in which the machine is moving at the completion of its travel, the cut can be finished to the full width of the room.

By raising or depressing the feed chain in advance of the machine, the latter is made to cut higher or lower in the coal. This chain is also used in making the entering of sumping cut, and also in removing the machine from the face and loading it upon its truck for transfer to another room. All of these operations are performed by power from the electric motor or compressed-air engine.

The latest type of these machines is arranged to make its face cut either right- or left-handed. The motor is also totally inclosed in a flame-proof case, adapting it admirably for use in gaseous mines.

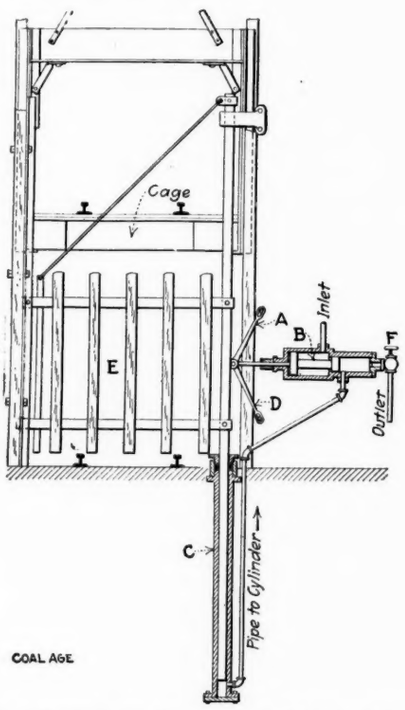
Where the local conditions will warrant the use of any chain-cutting machine, those performing a continuous cut are the most advanced and best perfected of all coal undercutters. Being far more powerful than the puncher or breast machine, their cutting capacity is proportionally greater, their expense of operation per ton of coal mined is correspondingly less and an increased output may be secured at a lower cost. Their development has extended the use of machine mining in drawing pillars and in work on steep-pitching beds, which heretofore has usually been done by hand.

An Automatic Safety Mine Gate

An automatic safety mine gate has recently been invented and patented by M. W. Harvey, of Sykesville, Penn., which, due to its simplicity and ease of manufacture, requires more than a casual notice. It consists of a cylinder approximately 6½ ft. long made of 4½ in. pipe and provided with a stuffing box at the top, inside of which works a plunger made of 4-in. pipe which has been turned down and polished to a diameter of 4⅜ in. outside.

The cylinder is placed vertically in the ground, which renders it frostproof. It may be set at either side of the gate to be operated as convenience may dictate. The gate itself may be made by bending two pieces of strap iron and bolting wood palings vertically between them.

A controlling valve, somewhat similar in principle to a piston valve on a steam engine, is provided. This is equipped with a contact for the cage in its proper position for loading. The outlet, or exhaust, is provided with a throttle valve to control the downward movement of the gate. The general arrangement can be clearly seen in the accompanying drawing.



The Gate and Operating Mechanism

The operation is as follows: When the cage is brought to position for loading from the ground, it makes contact with the lever *A*, which operates the piston valve *B*. This admits air or steam to the vertical cylinder *C*, forcing up the plunger *D* and with it the gate *E*. When the cage is moved from this position, the piston valve *B* is forced back to its original place by the pressure of the air. This releases the exhaust and allows the plunger and gate to descend. The rapidity of this descent may be controlled by the valve *F* to any desired speed.

In the ordinary operation of hoisting, the contact between the cage and the lever *A* is only momentary while the cage is passing that point. Consequently, the amount of air admitted to the main cylinder is not enough to start the plunger from its initial position, and the gate therefore remains stationary.

This gate can be easily arranged so that temporary removal of one of the guides on the opposite side from the plunger will allow it to be swung open for the loading of long rails or other material upon the cage.

One of these gates is in successful operation at a Pennsylvania coal mine, and we understand that four more are to be installed soon.

The annual loss due to the run-of-mine law of the state of Arkansas to operators and consumers is estimated to be $1,670,500; the loss to the miners is placed at $100,000, the market loss equals $1,600,000, while the loss through waste reaches $850,000. All of which gives the appalling total yearly loss of $4,220,000, due to hasty class legislation.

The New York Market in 1912

SYNOPSIS—Market conditions at New York, on the average, were satisfactory during the year. The trade in both anthracite and bituminous branches was active and profitable previous to the suspension in the mining regions. Succeeding this, however, the usual summer dullness developed in bituminous, but the fall trade was heavy and characterized by an unusually high price-level. Rather panicky conditions prevailed in the anthracite market over the last half of the year, due to the shortage as a result of the suspension, but the year closed with conditions approximately normal.

The importance of New York as a coal distributing point is probably not generally appreciated. Unfortunately no statistics covering the fuel handled there are available, but it is conservatively estimated that this runs approximately 32,000,000 tons per annum, about equally divided between anthracite and bituminous. Because of the smoke restrictions in effect, the consumption of the latter locally, amounts to less than 5,000,000 tons per annum, the remainder being shipped to New England ports or used in the bunker trade locally. It is estimated that about 12,250,000 tons of anthracite are consumed here, which is about 14 per cent. of the total production.

The First Quarter

The year opened with business fairly active. There was only a limited spot demand, but the movement was large, although not in excess of the contracts which absorbed all the arrivals without much delay. Transportation had been much better than during previous seasons at this time, and shippers were able to meet their obligations more readily than heretofore.

A demand for prompt shipment began to develop during the first month, due to the stormy weather which caused more than the usual inquiries for cargoes. However, a large number of barges had been loaded and waiting power to move them for some time, so that prices were not affected. Loading at the piers was considerably hampered by the freezing of the coal.

Congestion and accumulation of freight along the railroads retarded delivery of coal to line consumers, causing them much uneasiness over the supply and resulted in a sharp increase in the demand for rail coal. Marine transportation in the harbor and sound was quite hazardous in February, due to the ice conditions. The heavy demand and poor car supply was keeping the arrivals down with the result that local stocks were considerably below normal.

The near approach of the expiration of the agreement with the miners together with the short supply, stimulated the New York market early in March and prices advanced rapidly until even the poorer grades were being held at $2.90 to $3 f.o.b. with only small tonnages available even at these figures. The supply at the piers was extremely limited and shippers were only able to take care of their contracts.

Prices continued to advance rapidly through the month reaching the maximum about the middle, when spot bituminous was quoted as high as $4 to $5 f.o.b. It was believed at this time that the supplies were only about 50 per cent. normal and the market was apparently bordering on a panic.

The Second Quarter

The demand for bituminous became a little less urgent toward the close of the month and the market appeared to be steadying up. Prices, however, did not ease off and the change in the situation was due more probably to the hesitancy on the part of the consumers to purchase at the prevailing high prices, believing that there must shortly be a break in the market. That they were justified in this belief, is shown by the sharp decline which occurred early in April when quotations eased off to between $2.90 to $3.65 along side. The suspension in the mining regions was now in effect but there was not much anxiety apparent locally, as yet. This did not apply to anthracite, however, as the arrivals of this grade were entirely cut off and the consumers were becoming urgent in their requests for coal.

Arrivals of bituminous throughout the month were much below normal, but there was scarcely any demand due, no doubt, to the excessive storing in anticipation of a more protracted suspension at the mines. This had a decidedly depressing effect on the trade, and the market continued dull and heavy for a time.

The bituminous market gathered some strength at the same time in sympathy with the changed conditions in hard coal. This was however, more in the way of holding its own rather than making any advance. When the agreement was finally reached between the anthracite miners and operators about the middle of the month, there was a sharp flurry in the local markets.

The month of June saw little of interest in either the hard- or soft-coal markets. The larger anthracite companies reported an active business but consumers were not showing much interest in the markets due to the increased prices which the companies put in effect. The demand centered about stove coal, which was practically out of the market.

Third Quarter

The third quarter opened with the bituminous trade down at the customary low level at this period of the year. There were few transactions, but on the other hand there was no evidence of any appreciable tonnages on demurrage. The movement was confined almost entirely to contracts, any coal being sent in on consignment usually selling at prices even less than the cost of production.

Anthracite continued quite active throughout the month, with shipments considerably behind requirements. Stocks were far below normal and there was no doubt but what a decided shortage would be experienced during the coming winter. Stove was particularly short, with none of the grades easy and prices were firm with the exception of the steam sizes which were selling off in some instances.

The month of August opened with the soft-coal market about normal for that period of the year. The car shortage was quite apparent the first part of the month and there was a fair amount of contracting at average prices. Little or no coal was coming in on speculation with the

result that demurrage consignments were quite rare: it was evident that the companies were making a concerted effort to maintain better market conditions, by adopting a vigorous curtailment policy.

The strong heavy demand for anthracite continued unabated throughout the month. No stocks were being accumulated except in the steam sizes, on which a few companies were able to get ahead. The movement into New York continued slow, with little or no indication of any improvement. The shortage was most pronounced in the stove size which was practically out of the market, and by the middle of the month was bringing a premium of 25c. per ton above the circular.

The beginning of September saw a gradual but perceptible hardening in the soft-coal market. The visible supplies on hand were rather low for this period of the year and quotations began the steady advance which they were to continue for the remainder of the year. Inquiries were becoming more frequent but consumers were hesitating to enter the market because of the new high prices.

The Fourth Quarter

That there was a decidedly tense feeling in the New York bituminous market at the beginning of October was no longer to be questioned. The heavy demand at this period of the year was almost unprecedented and it appeared at this time, that the situation would be serious when the real winter trade set in. By the middle of the month nothing could be obtained under $2.85 and this only on the lower grades, Georges Creek and the better qualities being entirely out of the market.

The first of October saw little change in the anthracite trade; the prepared sizes were still short and the steam grades in rather long supply. The mines were being pushed to the limit, but production was curtailed slightly although not seriously by the lack of sufficient labor and the inadequate car supply. The large companies expressed the belief at this time that the present acute situation was brought about by the consumer attempting to acquire his entire winter supply at once.

The first of November found the bituminous market in as probably a hard a position as it had been for some years. The movement was confined almost entirely to contracts and producers were being hard pressed to meet their obligations. The trade was quite spotty at times and showed some indications of becoming softer occasionally, but supplies were short and all arrivals going into immediate consumption. The situation was relieved about the middle of the month, by the appearance of mild weather which caused the demand to lessen somewhat.

The first of December brought with it an abrupt and decisive break in the anthracite market. This was ascribed to the allotment of larger tonnages by the companies and partly to the mild weather conditions which had been prevailing. This continued well into the middle of the month, the water tonnages received by the large companies steadily reducing the premiums on the domestic grades.

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Chicago Coal Trade in 1912

SYNOPSIS—The past year was fraught with many uncertainties and anxieties, but on the whole was good so far as profits were concerned. Throughout the last few months particularly, the demand for all grades of fuel, including coke, was strong and insistent, with prices ranging exceedingly high.

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With the close of the year 1912, coal producers and distributors have much to be thankful for and comparatively little to complain about. It was a year fraught with many anxieties and, at intervals, gloomy predictions, but with the balancing of the books for the twelve months those in the coal trade find that it was a period of profitable dealing.

For the purpose of considering the varied features of the Chicago market, the year may be divided into four quarters as follows:

First Quarter

January—At the beginning of the year the market was technically strong, but sales were not particularly brisk. Smokeless lump and egg were selling at various figures with efforts being made to hold prices firm at $1.90 @ 2.

There was a period of severely cold weather during the week ending Jan. 13 and wholesale prices for all kinds of coal were forced to a level higher than any attained during the preceding six years. The average mine-run price was one-third higher than two weeks before. Low grade screenings doubled in value and a rise of 50c. in other sizes was not uncommon.

February—Expectation of a shut-down of the mines April 1 agitated the Chicago coal trade in the early part of February. As an outcome, a bullish influence was exerted on the market and railroads, public utility corporations, and others began acquiring surplus stocks of steam coal.

Storage buying continued to be the chief feature of the market in the latter part of the month with a break in some prices and advances in others.

March—When March arrived there was a slight recession in prices for domestic coal, but steam prices remained firm. Anthracite was a trifle weak, as a good deal of this fuel held in transit had reached the market. There was a 10 per cent. advance in coke during the first week of the month.

Second Quarter

April—Early in April what coal buyers there were bargained shrewdly with a view of beating down prices. There practically was no anthracite to be had and for some weeks the market was halting and uncertain.

May—Buying in the early days of May was done chiefly by the railroads which had supplied themselves with only enough storage coal to tide over the suspension of the mines. The coke market was active. Toward the middle of the month there was some demand from small steam users. Screenings, mine-run and steam lump all sold around $2.10 @ 2.25, f.o.b., Chicago.

June—At the beginning of this month announcement was made by the trade of an advance of 25c. a ton

in the price of anthracite. Other important events occurring about this time included the agreement reached between the Indianapolis operators and miners, the appearance of a number of contracts from the railroads and the resumption of work in Iowa.

THIRD QUARTER

July—During the first part of the month screenings remained firm, but domestic lump prices were exceptionally low. In a number of instances, this grade sold below $1 a ton, but smokeless lump and egg continued to be scarce.

August—Smokeless mine-run advanced 15c. Aug. 3, while smokeless lump and egg jumped from $1.90 to $2. There was much discussion among the trade concerning the influence on business of big crops and a car shortage. August 8 there was an advance of 10c. a ton on Franklin County coal. There was an advance of an equal amount on splint coal, while screenings fell off sharply 5c. a ton.

September—A rise in the price of Hocking Valley coal to $1.65 a ton was noted Sept. 7. Coke prices were strong and in many instances dealers were handling twice as much of this fuel as during the corresponding period in 1911.

A premium ranging from 10c. to 50c. was paid Sept. 21 for smokeless coal. The circular prices on Franklin County and Carterville coals were advanced 25c. a ton, while there was an increase of 15c. a ton in the price of Hocking. Splint was strong and 5c. a ton was added to the price of screenings.

FOURTH QUARTER

October—At the beginning of this month the Chicago coal market was on a rampage. Nearly everything that went by the name of coal could be sold at a fancy price. Some kinds of domestic lump commanded $2 while good grades brought from $2.25 to $2.75. In a number of instances prices were raised to such a level as to prevent buying. Many producers were off the market and called in their salesmen. There was an upward shoot in the price of smokeless. Mine-run, with a circular price of $1.25, sold at $1.50 in 100 carload lots and at $1.60 in lots of ten cars or less.

November—Throughout the first week orders for coal in Chicago exceeded the supply. Anthracite was exceptionally scarce and consumers bought other coals from necessity rather than from choice.

A break of from 25c. to 40c. a ton in the market for domestic coal was reported during the week ended Nov. 23. This drop was attributed to warmer weather prevailing at that time.

December—The beginning of December came with the market still strong and the demand for steam coal the greatest it had been in years. During the latter part of the first week in this month, however, there was a drop of about 25c. a ton in the price for domestic sizes of coal, due to the warm weather. The steam market continued strong. There was little change in coke quotations.

When the holiday season arrived, retail dealers and steam users did not buy coal except to satisfy immediate needs. The market was unusually quiet, but prices remained firm.

The Talking Cocoanut

"While in the government employ in the Philippines," says Sanford Jones, manager at North Yakima, "I was stationed on the Island of Basilan, which is a small island in the Sulu Archipelago. The natives of this island were so uncivilized that they did not even know the value of money, and of course had never heard of a telephone. Frequently they entertained us with their native dances, and in turn we would fill them with wonder and awe by a phonograph which we had in our outfit.

"Once we found it necessary to put up a telephone line between two buildings that were a little distance apart, using two 'Western Electric' magneto sets. I found a rather large cocoanut under a tree near the bamboo hut we were living in, and conceived the idea of making a cocoanut talk. So I emptied its contents and hung it on the outside of the house opposite the phone, and arranged it so that we could put the receiver through the grass wall and drop it into the cocoanut.

"We then invited some of the natives to see the wonderful cocoanut that we could make talk. With the aid of an interpreter at the other phone who understood their language, we had a lot of fun. Some of the natives were so frightened they left the village.

"One day a delegation of natives came and asked us to burn it, as they did not like to have so uncanny a thing around. So with great ceremony and much rejoicing we consigned it to the flames, and to this day I suppose they are telling their children about the cocoanut that could talk."

Small Tonnages in the West

By BENEDICT SHUBERT*

In the Rocky Mountain district, a large daily tonnage is rarely obtained over one dump. In comparison with the results at some of the Eastern mines, it might be inferred that the Western operator does not concentrate his work and is losing the advantages to be gained from handling a large daily tonnage at one point.

The demands of the coal trade in the West, places a handicap upon the producer not found in Eastern districts. It is true that a large tonnage can be economically taken from one opening and as economically screened, but the fact that it is necessary to load all lump and nut coal into box-cars, introduces a serious obstacle in the handling of large tonnages at one point.

For a daily tonnage of over 1800, the loading of practically all this coal into box-cars is a serious problem. The delays attendant to placing the cars and running the box-car loader in and out seriously cuts down the actual working time. The introduction of two or three box-car loaders, two extra loading tracks, the necessary storage bins and elevating machinery for handling the nut coal, together with the extra labor involved, complicates matters further and has prevented the development of large-tonnage tipples.

In a word, it is necessary to balance the economies of concentrated operation against the extra expense of loading this tonnage into box-cars so that the smaller operation is usually a better paying proposition.

*Boston Building, Denver, Colo.

Notes on Mine Gas Problems—I

By G. A. Burrell*

SYNOPSIS—The lower "explosive" limit of methane is nearer 5.5 than 6 per cent. and varies somewhat with the size and shape of the explosion vessel, kind of igniting body, degree of temperature, intensity of pressure, percentage of moisture and point of ignition. The upper limit is 12.4 per cent. But partial inflammations could be obtained below and above the limits mentioned. The presence of 10 per cent. of carbon dioxide raises the lower limit to 6.6 per cent. An explosion of 9.40 per cent. of methane was obtained, when the oxygen percentage was reduced to 14. With 12 per cent. oxygen and 6 per cent. methane a complete inflammation was obtained. Hence, J. Harger's plan of reducing the oxygen and adding to the carbon dioxide of mine air, will not entirely prevent explosions.

The limits of explosibility of fire-damp have been worked out by different investigators, and results, which in the main are in accord with each other, have been determined in their laboratories. Some discordant conclusions have been published, but these have resulted mainly from the fact that different experimenters have performed their work under different conditions. Sufficient emphasis has not always been placed upon the decided effect experimental conditions exert on the results.

The Variants on Which Explosibility Depends

The size and shape of the vessel employed, the nature of the source of ignition, i.e., whether a flame, a small electric spark, a large electric flash, the ignition of the mixture from above or below, the moisture in the sample and the temperature and pressure, all may have influence in determining the limits of explosibility of mixtures of combustible gases with air.

A partial burning takes place when the ignition temperature is reached, whether an explosive proportion of combustible gas is present or not. The extent of this burning will depend upon some of the conditions to which I have just referred.

But an explosion in the true sense of the word means a self-propagation of flame to all parts of a mixture without help from the source of combustion other than the ignition of the mixture at one point. The smallest quantity of any combustible gas which when mixed with air will enable this self-propagation of flame to take place is termed the lower limit of explosibility of the gas.

Low Explosive Limit of Methane with Air Mixtures

The low explosive limit for methane is about 5.50 per cent. methane and not 6 per cent., as is sometimes stated. Coquillon ignited methane-air mixtures in a closed vessel by means of an electric spark, and placed the lower limit of explosibility at 5.8 per cent. gas. Le Chatelier and Mallard and Boudouard have placed the limit at 6.0 per cent.

Eitner determined the lower limit of explosibility of methane to be 6.1 per cent. Clowes obtained 5.0 per cent. as the low limit of explosibility when the gas was fired from below with a flame and 6.0 per cent. as the limit when the gas was fired from above. Teclu found the lower limit of explosibility to be between 3.20 and 3.67 per cent.

The most recent values are those obtained by Burgess and Wheeler of England, who place the lower limit of explosibility between 5.50 and 5.70 per cent. No discussion of the different methods of experimentation will be given here, the idea I desire to convey being that an exact duplication of results by different experimenters has not always resulted.

In the laboratory of the bureau, an explosion could not be obtained when a mixture of methane and air containing less than 5.50 per cent. was subjected to the action of a small ⅛-in. spark from an induction coil. The latter was fed by four dry cells. The mixture was placed in a 100 c.c. spherical vessel over mercury.

An explosion could not be obtained with 0.10 per cent. less methane even when the pressure was increased from one to two atmospheres. A pronounced explosion occured when 5.50 per cent. methane was present, but the combustion was not quite complete. Analysis of the products of combustion showed, however, that only a trace of combustible gas remained unburnt. The experiment was made with a pure methane prepared by the action of alcohol and methyl iodide on a zinc-copper couple.

A Mere Flame Extension Is Not an Explosion

A number of experiments have been performed in the laboratory of the bureau in which a flame has been used as the source of ignition. In some of these experiments, a spherical flask having a capacity of one liter (61 cu. in.) has been used. Some burning followed under these conditions when as little as 4.75 per cent. methane was present and when ignition was effected from below. The burning extended as a cone about halfway to the top of the flask. Inflammation in the mixture increased with increasing percentage of methane. Of course, all mining men have noticed this behavior in mixtures of combustible gases and air.

With a very small percentage the inflammation starts as a cap on the flame. The inflammation spreads from the source of ignition as the percentage of combustible gas is increased. Finally, conditions are right for a violent projection of flame throughout the mixture. At about 5.50 per cent., the low limit of explosibility, the flame extends to all parts of the vessel, but travels with comparative slowness and can be followed by the eye. With increasing proportion of methane, the explosion becomes more violent.

A Mixture Which Propagates Flame Throughout Its Volume Should Be Said to Explode

It was observed that the partial burning in a mixture containing less than 5.50 per cent. methane depended up the several factors, such as nature of ignition, shape of container, etc., but that complete explosion could not be obtained, no matter what the experimental condition, when less than 5.50 per cent. of methane was present.

In determining the low explosive limit of methane-air

*Chemist, Gas Investigations, Bureau of Mines, Pittsburgh, Penn.

Note—Part of an article read at the winter meeting of the West Virginia Coal Mining Institute, Parkersburg, W. Va., Dec. 11, 1912.

mixtures, the products of combustion were examined to ascertain to what extent the gases had been burned. In experiments to follow, this was not done, unless otherwise stated. The term explosion will be retained to mean that the flame filled the container as far as could be seen by the eye. Inflammation will mean only a partial filling of the container by the flash. All experiments were made at atmospheric pressure.

High Explosive Limit of Methane-Air Mixtures

When the small spark from an ordinary induction coil was used as the source of ignition, no explosion in methane-air mixtures could be obtained after the methane was raised above 12.40 per cent. In these tests, a vessel hava capacity of 100 c.c. was used. When we used an electric flash, produced by breaking copper wire terminals through which a current of 220 volts and 7¾ amperes were flowing, different effects were observed. The mixtures were confined in a glass cylinder 4.5 in. wide and 12 in. high. The flash was produced in the center of the jar.

When a mixture containing 20 per cent. methane and 80 per cent. air was ignited, some inflammation occurred, extending a distance of 3 in. above the electric flash, but none was observed below it. In the presence of 15 per cent. methane, inflammation extended to the top of the jar and somewhat to the sides, but not downward. In the presence of 13.5 per cent. methane, the inflammation filled the upper part of the jar and spread downwards to within an inch of the bottom. In the presence of 13 per cent. methane, the flame seemed to fill the entire jar. Effects, about similar, were observed when a gas flame was applied from below to mixtures of methane and air.

Effect of Carbon Dioxide on the Explosibility of Methane

In explosions, as well as in flame extinction and physiological effects, the influence of carbon dioxide in mine air has usually been overestimated. Carbon dioxide always occurs in mine-gas mixtures in which explosive amounts of methane are present and there is always a greater oxygen deficiency than exists when the same amount of methane is added to air for sample laboratory experiments. The following tests show something about the explosibility of methane both in the presence of excessive proportions of carbon dioxide and when the oxygen is considerably reduced.

In the laboratory of the bureau, when 2.5 per cent. of carbon dioxide was present in a mixture, an explosion followed on the methane being raised to 5.83 per cent. With 5.0 per cent. carbon dioxide, an explosion occurred when the methane was raised to 6.25 per cent. With 10.0 per cent. of carbon dioxide present, an explosion was obtained when the methane constituted 6.60 per cent. of the total. A small spark from an induction coil was the source of ignition. The experimental conditions were the the same as those under which the 5.50 per cent. low explosive limit for methane and air was determined.

The presence of carbon dioxide narrows the explosive limits, but it will be observed that even 10 per cent. only raised the low limit to 6.60 per cent.

Effects of Reduced Oxygen on the Explosibility of Methane

A spherical flask having a capacity of one liter (61 cu. in.) was filled with a mixture containing the following gases:

AN EXPLOSIVE MIXTURE OF GASES

Gas	Percentage	Gas	Percentage
CO_2	0.03	CH_4	9.40
O_2	14.00	N_2	76.57
			100.00

When exposed to a flame from above, inflammation occurred. The flame spread downward to the middle of the flask, and out to the sides. The eye could easily follow the course of the wave. When the mixture was ignited from below with a flame, it exploded with considerable force. As far as the eye could see, the flame filled the entire flask.

Further experiments were made in which the oxygen had been reduced to 13 per cent. This mixture had the following composition.

AN INFLAMMABLE MIXTURE OF GASES

Gas	Percentage	Gas	Percentage
CO_2	0.03	CH_4	9.40
O_2	13.00	N_2	77.57
			100.00

This mixture was placed in a cylindrical vessel 4.5 in. long and 12 in. high. Two copper terminals were quickly broken to produce the flash, which took place in the center of the vessel. A current of 220 volts and 7.5 amperes was used. A flash about ½ in. long was obtained. On the breaking of the contact, the inflammation spread upward almost to the top of the jar.

With the same percentage of methane, but with 12 per cent. of oxygen, and under the same conditions of experiment, only a slight inflammation extending about 3 in. upward was obtained. But with 12 per cent. oxygen and 6 per cent. methane, the flame filled the entire top of the jar. With 15.1 per cent. oxygen and 9.4 per cent. methane, a quite violent explosion was obtained under the same conditions of experimentation.

Experiments were also performed in which a small ⅛-in. spark from an induction coil was used as the source of ignition. A mixture having the following composition exploded.

A MIXTURE WHICH EXPLODED

Gas	Percentage	Gas	Percentage
CO_2	3.92	CH_4	9.43
O_2	16.25	N_2	70.39
			99.99

Under the same conditions, a mixture in which the oxygen was slightly diminished from the foregoing, and having the following composition, did not inflame at all.

A MIXTURE WHICH WAS NON-INFLAMMABLE

Gas	Percentage	Gas	Percentage
CO_2	3.99	CH_4	9.25
O_2	15.90	N_2	70.86
			100.00

In all of these explosibility experiments, both the large electric flash and flame (flame applied from below) produced decided inflammation under more severe conditions than the small ⅛-in spark. In each case, when used, the small spark was applied near the top of the mixture. The analyses are accurate to about 0.10 per cent.

These are only a few of many experiments which have been made on explosibility of gaseous mixtures at the laboratory of the bureau. They are given as showing something about the limiting proportions at which methane ceases to be inflammable under the conditions in which it occurs in mines. Such knowledge has been es-

pecially useful to the bureau in that frequently it has been desirable to know something, before explorations have been made, about the explosive character of the atmosphere in sealed areas and in other workings in the mines where ventilation has been interrupted.

From the foregoing and from experiments to follow, we can also conclude that oxygen in mine air at one place may be diminished to such an extent that a miner's lamp will not burn, but at some point beyond, a flicker of a flame made in an attempt to relight a lamp, or the flashing of an electric spark, might precipitate an explosion if enough methane was present.

The Harger Cure for Explosions

Much interest has followed the proposal of John Harger of England[a] that the oxygen be decreased and carbon dioxide increased in mines to prevent explosions. Briefly, Dr. Harger's proposition is this: A small reduction in the oxygen percentage and a small increase in the carbon-dioxide percentage in mine air will suffice to produce an atmosphere incapable of supporting combustion and consequently one in which explosions and gob fires cannot occur.

For average mines, it is suggested that in order to start the experimental work on a large scale, the oxygen should be reduced to 20 per cent., i.e., one per cent. below normal, and a half per cent. carbon dioxide added to it. Where the conditions are more dangerous the oxygen should be further reduced, say, to 19 per cent., and the carbon dioxide increased to three-quarters of 1 per cent.

Experiments which have been performed by the bureau, some of which are here presented, indicate that the oxygen percentage will have to be reduced much below the figures mentioned by Dr. Harger to prevent all explosions. However, if all conditions are identical, the mixture will explode less violently and less completely in proportion to the decrease of oxygen percentage. As regards carbon dioxide, it appears that so much would have to be added to prevent firedamp explosions that its use for this purpose of treating normal mine air would be precluded.

Mine Gas Mixtures Containing Explosive and Other Proportions of Methane

Below are given analyses of mine-gas samples, some of which contain explosive proportions of methane. The accompanying carbon-dioxide and oxygen content are of interest in connection with foregoing experiments.

The samples were collected in the rooms of mines wherein ventilation had been interrupted for some time. Explosions have occurred in these mines.

SOME SAMPLES OF MINE AIR

Sample No.	CO_2	O_2	CH_4	N_2
1	8.28	10.50	4.49	76.73
2	0.48	17.49	9.20	72.83
3	5.81	13.95	5.07	75.17
4	1.75	17.63	7.60	73.02
5	0.34	19.46	5.79	74.41
6	0.35	18.81	7.25	73.59
7	2.00	15.64	7.37	74.99

Samples No. 2, 4, 5 and 6 are explosive. It is not believed that even an inflammation could be obtained in mixtures represented by samples No. 1 and 3.

(To be concluded in an early issue)

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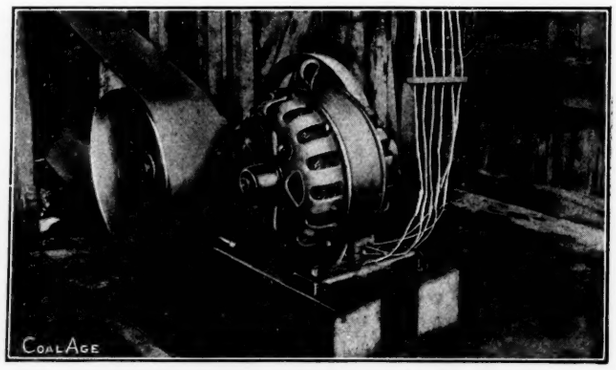
Experiments made in England have shown that ashes or common salt properly spread will destroy the larvae and eggs of hookworm at 77 deg. F. This is an economical method of disinfecting chambers used in place of the portable conveniences which are sadly lacking in most American mines.

[a] The Prevention of Explosions in Mines. Transactions of the Institute of Mining Engineers. Vol. XLIII, Part 2, pages 132-166.

Two Speed A. C. Motor for Mine Fan Drive

An excellent example of the efficient adaptation of electricity to mine service is illustrated in the accompanying picture, which shows a two-speed, alternating current, three-phase, 60-cycle, 440-volt motor belted to a Guibal 12-ft. fan installed in the Greensburg No. 1 mine of the Keystone Coal Co., near Greensburg, Westmoreland County, Penn.

The force of miners is considerably less at night than during the daytime, and consequently it is desired to run this fan at only about one-half the speed at night that is required during the day. For this service there was selected a Westinghouse squirrel-cage type induction motor with a rating of 7½ hp. at 600 r.p.m., and 15 hp. at 1200 r.p.m.



Two-speed A. C. Motor Driving Mine Fan

The change in speed is accomplished by altering the number of poles. The stator of the motor is provided with two windings; one of which gives 6 poles, resulting in a speed of 1200 r.p.m., and the other gives 12 poles, with a speed of 600 r.p.m. The connections are changed from one set of windings to the other by the controller. This is a most efficient form of control for an installation of this kind, as the motor can be operated at low speeds and high efficiency; there being no losses in the control resistance. The motor itself is particularly well adapted to this class of service on account of its rugged characteristics, which insure great reliability of service.

Current for the operation of this machine is furnished by the West Penn. Electric Co. In order to determine the results obtained from the installation, tests were made by C. V. Elliott, electrical engineer of the lighting company, which showed the following excellent results:

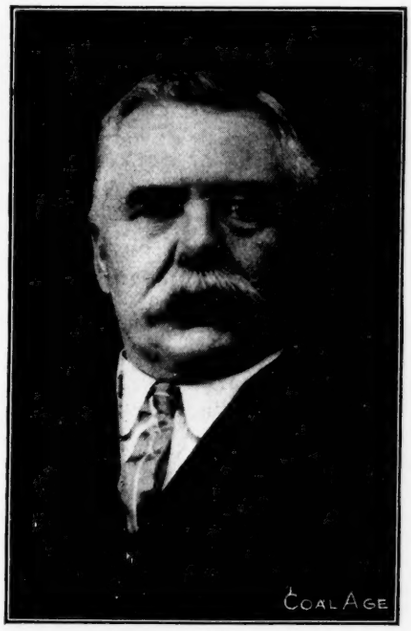
The fan is 5 ft., 6 in. wide, and the depth of blades 3 ft. 6 in. When running at 120 r.p.m., with 1.5-in water gage, or an equivalent pressure of 0.87 oz. per sq.in., 46,200 cu.ft. of air per minute were delivered. The motor in performing this work took 9.6 kw., giving an efficiency of 63.03 per cent. for the outfit. When running at half speed, or 60 r.p.m., with 0.6-in. water gage, or 0.29-oz. pressure per sq.in., 14,850 cu.ft. per minute were delivered, and an efficiency of 58.33 per cent. was obtained.

These results are particularly important as they show economy in the use of purchased power, which is becoming standard practice where alternating current is available.

WHO'S WHO—IN COAL MINING

An old myth tells how a giant, Antæus, could vanquish his adversary Hercules whenever he could touch Mother Earth and gain strength from the contact. And the theorist is never at his best in the world of practical and material things unless he has had some years at actual toil.

This is the real upbringing. This is the real royal road to achievement of which we hear so much. Yet it is one we all might travel if we would, were we not so desperately afraid of the cold, hard contact with Mother Earth and of what we are pleased to call the drudgery of toil.



THOMAS THOMAS

Thomas Thomas was born in Wales in 1860, the son of Shadrach Thomas, a Welsh miner. When the young boy was three years old, the family embarked for America. Shortly after landing, Shadrach Thomas took up his abode in Pittston and later placed the boy in the public schools.

Still later he was sent to the "pay" schools which were then so general in the anthracite region. But at nine years of age, he entered the mines as a trapper and thence he went to the breaker. At 14, he was a full-fledged driver boy. At the present time, he could not be even a trapper at that early age but different views were held in the seventies.

His first work was in the Twin shaft, the scene of a disaster caused by the heavy load of glacial drift in the Wyoming "buried valley." This crushed in the roadways and killed several men. Such an accident has never been duplicated in the anthracite region. This colliery was then owned by the Pittston & Elmira Coal Company.

Later, young Thomas became a runner and let cars down from the working faces to the levels. Then he commenced to load coal as a laborer and finally he became a miner. There were thus few places in the mine which he did not fill before he was 20 years of age. In those days there was not the multiplicity of occupations which can be found in modern mines.

In 1880, Thomas Thomas was working in the Exeter mine and having saved a little money by frugality he decided that he needed mental development and took up a course of study at the Lewisburg Academy. An education, paid for from the savings of the student, earned by some ten years of steady toil was not sought in the half-hearted way pursued by the young man who goes to school at the parental admonition, and Thomas Thomas burned the midnight oil, endeavoring to make up the deficiencies in the education of his earlier years. In 1885, he entered Lehigh University and after five years of study he graduated.

During each vacation period he went back to the mines, part of the time working on the engineering squads of the Lehigh Valley Coal Co. In 1891 he was made outside mine foreman at the old Enterprise colliery of that company. Shortly after he was transferred to the Exeter colliery, serving as general inside foreman.

In 1901, he became superintendent of the William-A and Seneca collieries. Four years elapsed before his next promotion and in November, 1905, he became division superintendent of the Lehigh division and established his headquarters at Hazelton. So well did he handle the work of this responsible position that in 1907 he was transferred to the Wyoming division, the largest under the company; there he became superintendent.

Following the promotion of F. M. Chase to the position of vice-president and general manager of the Lehigh Valley Coal Co., to succeed S. D. Warriner, it was decided to create the position of mining superintendent, and abolish the office of assistant to the general manager.

According to this plan, announcement was made Oct. 1, 1912, that Thomas Thomas was the new mining superintendent. He was given complete control of all the mining operations of the company, both inside and out. Under his charge are thirty-two collieries and several washeries scattered throughout the anthracite fields. In all, an army of 25,000 workmen is directly responsible to him.

Both educated and experienced is Thomas Thomas, but somehow neither of these qualifications, important as they are, overshadow in him that other characteristic, just as vital to success—the quality of personality. A man who has been through the mine, filled every place, worked at every job and yet has had a college experience, bridges the gap between the office desk and the mine face, the unfathomable abyss, as it seems, between the man who works and the man who, as the foolish phrase goes, "only thinks for a living."

Thomas Thomas has not forgotten the humble little cottage at Pittston, the dinner-pail days, the early walks

to the breaker, the dangers of the coal face. His interest in the miner is not the sympathy of an outsider but the clear full-faced vision of one who has but to look back in his own life to find similar experiences. The miners like to deal with men of that kind and it is to be hoped that the future may see the mines officered by more of such democratic talent, not only well trained but well experienced. It will prevent that segregation of class interests, of which the worst is to be feared.

Mr. Thomas is a pleasant, affable man who desires only to impose what he would himself be prepared to accept. And he realizes what is fair because he knows the mine from the shaft mouth to the face and the outside works from the headframe to the main railroad switch. There are not many young men who, after 11 years on the firing line, will return to their studies to put a final finish on their education.

Before such men, there opens up a large future. With bodies developed by early toil, with the mind matured by contact with men of action, made independent by the thought that they can take their place at any time in the ranks of labor, such men have a strength not usually to be found among those who have not mixed the practical with the theoretical, but have seen and probably thereafter always will see life through the spectacles of their academic education.

But above all, the feeling of the Lehigh men for Thomas Thomas is one of pride in an old friend who has "made good." Those who have known him from boyhood and knew his father before him, recognize his solid purpose and real worth. The younger men realize in him a promise that work well performed will not be forgotten and that the high places of corporational control are not beyond those, who, beginning at the bottom of the ladder, keep their eyes fixedly on the topmost rungs and their feet pressing steadily upward.

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Protection of Trolley Wires

By U. U. Carr *

To safeguard employes about the mine against contact with trolley wires, as is required by the mining laws of some states, boards placed parallel to and on both sides of the conductor are claimed by many to afford an efficient and inexpensive means of protection.

*Engineer, Monongahela River Consolidated Coal & Coke Co., Pittsburgh, Penn.

Many different methods have been employed to suspend protection boards placed in this manner, and where a permanent installation is desired, the hangers shown in the accompanying cuts have proven satisfactory.

Where the usual type of trolley hanger, carried on an expansion bolt in the roof is used, Fig. 1 illustrates the method of supporting the protection boards. The iron strap is provided with a hole in the horizontal portion, into which the boss on the base of the trolley hanger fits. This strap is thus clamped between the roof and the hanger base when the latter is screwed onto the expansion bolt.

Preferably this hole should be drilled or punched the same diameter as the bolt holes and drifted to its proper size. All the perforations can be made in the strap before bending.

The boards may be joined at the hanger by making a half-notch in each, as shown in the side view of Fig. 1, or they can be spliced between hangers by butting them end to end and nailing on a batten.

They should be of sufficient width and placed low enough to extend below the point of greatest sag in the wire.

Where the trolley hangers are secured to over-head timbers, by means of lag screws, the protection boards may be carried by a similar strap, as shown in Fig. 2. In this case, holes are drilled in the strap to match the holes in trolley hanger base and the former clamped between the timber and the hanger.

These methods of supporting the protection boards have the advantage of utilizing the necessary trolley wire supports and making them perform the double duty of carrying the wire and also the boards.

If the trolley hangers are spaced more than 15 ft. apart, an intermediate strap should be provided for the boards. In cases where it is desirable to carry these protections, independently of the trolley wire supports, a hanger of round iron, shaped as shown in Fig. 3, and driven into the roof will answer the purpose. No bolts are required with this arrangement, as the boards are allowed to lap at the hangers and the thickness of two boards should fill the space in the bent portion of the hanger.

Where the roof will not permit the boards to be placed or removed from the top, this is accomplished by sliding them endwise to clear the hangers.

Each board should extend beyond or lap over the round hanger at least 3 in.

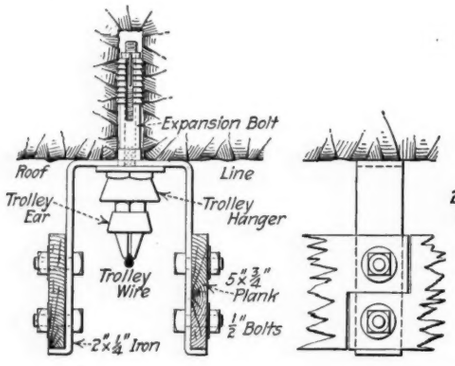

Fig. 1. Double Hanger Suspended from Roof

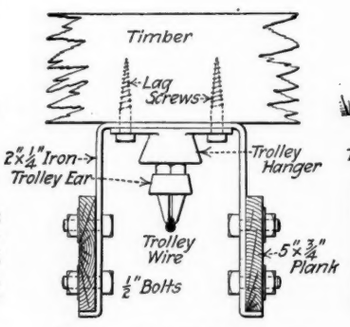

Fig. 2. Double Hanger Suspended from Timbers

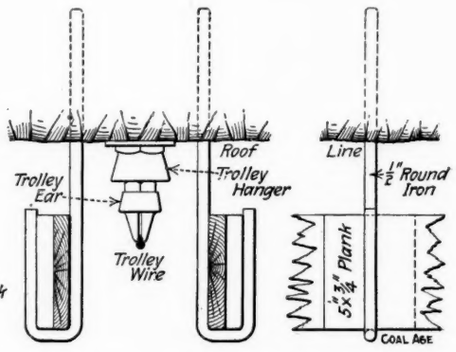

Fig. 3. Single Independent Hangers Driven into Roof

EDITORIALS

A Bituminous Trust

The people of the United States are not unalterably opposed either to trusts or to reason. Their theory of government, viewed along broad generic lines, does condemn, it is true, all amalgamations which are in restraint of trade. But they do not condemn labor unions, which are, in a real sense, trusts, and there has been a tendency to favor combinations of farmers and tobacco raisers, who seek to obtain higher prices for their produce and reduced rates for the storage of their goods.

The right to a fair compensation for services rendered to the community is thus generally recognized. Unfortunately in some cases the compensation taken by monopolists has not been fair, and in other instances, the public has set itself up as a judge when it did not understand the conditions it was endeavoring to adjudicate.

The recent increase on the price of anthracite was a case in point. This boosting of the circular rates was condemned by almost all the papers alike without careful inquiry as to what the increases actually were. Some of the reputable papers doubtless soon realized their error, but they did not care to retract their mis-statements; the others doubtless never sought the truth and would have published their diatribes in any event.

It is not now our intention to discuss the anthracite trust, but rather the prospect of creating a successful control of the bituminous-coal market after a needed change has been made in the sentiment of the electorate and in the laws on the statute books. It is useless to endeavor to harrow the mind of the average man with the misfortunes of the producer. The consumer is not disposed to be sympathetic and indeed he cannot afford to be.

An increase in the cost of coal is not a desirable end for legislation, yet this is usually the sole and declared end of those who would create a trust. The monopolist must present the public with some more logical basis for coöperation. In fact it does not appear impossible to forecast and promise that a unification of bituminous interests might lower costs of fuel.

It seems a violence to reason to declare that the cost of fuel is too high everywhere in face of the fact that many of the largest producers are in the hands of receivers. However, not only the cost of mining, but the cost of transportation as well, enter into the question, and only a large combination can hope to compel reductions in this item.

When the Standard Oil Co. found the costs of transportation on its oil were too high, it threatened to build pipe lines, and immediately obtained rebates on its own oil and even on that shipped by others. Small companies would have pleaded in vain, no, rather they would have failed to plead at all. They would have spent their time trying to reduce the pay of their pumpers and refiners or in endeavoring to harass and underbid one another.

The question of transportation, except competitively, would have been wholly overlooked, because a general reduction of all oil-transport rates with unlimited competition would not have been divided between operator and consumer. The latter would have received it all and the change would have left the producer subject to more competition by reason of the reduced expense necessary to enter the business with only the lowered freight rates to meet.

It is a fact that small profits almost invariably make narrow-minded operators, just as low wages make wooden-headed employees. The lower price of oil owes not a little to the power of the Standard Oil Co. to lower the railroad rate and of the Interstate Commerce Commission to give all the competitors of that oil company an equal transportation charge.

Just as the Standard Oil Co. threatened to build pipe lines, so could a big coal corporation compel the railroads to make needed concessions by the building of a canal or of a rival railroad. Or it could bring pressure to bear by converting all the coal into gas or electricity and transporting the product by pipes or wires to the market.

But such minatory attacks on the railroad corporations cannot be made effective by companies having small purses, though carbo-electric conversion on a small scale does not necessarily involve a large investment. To unamalgamated companies the railroad rate is fixed as by a divine fiat. The average operator would not attempt to argue with the nod of the Wall Street office.

This ability to reduce railroad rates in the hope of sharing with the consumer in the benefits of the reduction is but one of the advantages which a combination would afford. Many developments could be expected from a unified interest, which a number of jarring elements cannot hope to effect.

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A Word with Our Readers

We are desirous that every subscriber to COAL AGE take an active part in discussions that occur in these pages. It is also our wish that many more of our readers would contribute articles on some phase of coal-mining and coke manufacture. Not every article received by us will be published, for it often occurs that a contributor will submit a paper of considerable merit, but which deals with a problem of only local interest or discusses a subject already covered in some recent issue.

It is certain that many more articles will be received than we can use, so there is little or no occasion for a subscriber to feel discouraged if his first attempt at authorship proves unavailing. Furthermore, articles are not judged according to the reputation or personal popularity of the contributor, but solely on the character and original value of the information contained.

One statement may be made in this connection, however, and that is concerning neatness and legibility. It is just as easy to use a little more paper and double space

all the lines, as it is to crowd the writing so that the editor must turn the manuscript over to an assistant to decipher and copy before it can be intelligently read. There is no denying the fact that a carefully written article, properly paragraphed and neatly laid out, will make a better initial impression and receive earlier editorial attention than a slovenly prepared manuscript of equal technical value.

We wish to call attention again to the fact that we will pay $20 for any five- or six-hundred-word article, suitable for publication as a "Foreword" on our first page. The subject may be ethical, technical or general—just so the meat is there.

Then there are the pages of "Ideas and Suggestions," which in a general way are sub-forewords. These little talks by our readers have proved both interesting and popular and are paid for at an unusually liberal rate.

We are sure all our subscribers have appreciated the pages of "Snap Shots" recently published, and we intend to continue this feature of our paper. Every photo which we print is paid for, and the best picture each week is awarded a prize of $5. No view shown is valued at less than $1.

On Feb. 1, the entire issue of COAL AGE will be devoted to the subject of "Power" at mines. There are dozens of modern colliery equipments deserving the attention of the industry. Send us a description of some unique power installation or efficient arrangement which has come to your notice. Help us make this "Power" number the best of its kind ever issued. Copy must reach us not later than Jan. 25.

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Self Propagating Inflammation

It would be disingenuous for us to attempt to hide from ourselves, or to deny to our readers, the fact that G. A. Burrell, in making his address before the West Virginia Coal Mining Institute, purposed to make a "retort courteous" to COAL AGE and the technical press.

This purpose does him much credit, for we conceive that, with us, the Bureau of Mines is engaged in the informing of the industry. It would be negligent in the performance of its duties did it not take due exception to anything we might publish which appeared incorrect or misleading. Similarly, we have felt such a duty impending on us, which we hope we have not been disposed to shirk.

As Mr. Burrell did not fail to test the button on his foil before entering the conflict, we propose to thrust, guard and parry with equally invulnerable weapons. We desire that this reply may be taken, not as shrouded sarcasm, but in the most solemn literalness.

The section of Mr. Burrell's paper, which we reproduce today, details the percentage volumes of methane which are explosive, determining the higher and lower limits of explosibility. Made as carefully as his tests are, we shall be disinclined to cavil at his results, and shall be content merely to object to his manner of expression, which we have not hitherto followed and do not desire to adopt.

The use he makes of the word "explosion" follows neither the popular practice, the preferences of advanced scientists, nor the definitions of the dictionaries. Nor does it agree with the philology of the word. Soundless plaudits, like noiseless explosions, are alike unthinkable. Derived from the Latin root signifying "clap," the word explosion has, from the time of its first use, involved the sense of an action producing sound. In earlier years the word was used to express among other things the clamorous clappings and vociferous bellowings with which the unpopular Roman actor was driven crestfallen from the stage.

The dictionaries add to this root-meaning the idea of expansion, and term an explosion "a violent bursting expansion with noise." The public, whose unexpressed opinion constrains reluctant lexicographers, declares that "explosion" is not a synonym for "inflammation." On the other hand, the British writers, Doctor Thornton in particular, agreeing neither with Doctor Burrell nor with the vulgar herd, term "explosions" all those kinds of methane inflammations which are not mere caps on a flame.

As we have pointed out, Mr. Burrell is not so radical, and we congratulate him on his stand. Even if it is not as logical as the British view, it is more practical and gives results which are more closely consonant with the definition of an explosion as approved by popular judgments, lexicographic preferences and philologic precedents.

All inflammations probably produce sound. Helmholtz has shown that air vibrations of lower frequency than 16 per sec. fall without effect on the insensitive human ear, and we all know that sound waves of slight intensity fail to cause perceptible vibrations of the auditory nerve.

Hence, in an extremely modified sense,, all inflammations are probably explosions. Even the burning of a gas jet may be made to produce musical sounds. But the judgment of most of us is that an explosion must make at least an audible sound, and not merely one which is too infrequent in vibration and too feeble in intensity to be detected by the human ear.

We have seen how widely modern writers differ from the best everyday usage in their definition of the word "explosion." Mr. Burrel takes a medium viewpoint and is sure that "an explosion, in the true sense of the word, means a self-propagation of flame to all parts of a mixture, without help from the source of combustion other than the ignition of the mixture at one point."

Why not use another term for this low limit? Does it seem desirable to use a popular word like "explosion" in such an extremely technical way? Where a body of powder or dynamite burns away quietly without detonation, we do not say it explodes; we say it burns or deflagrates. Why make a new meaning for explosion, to be applied solely to methane and similar gaseous bodies?

There were other expressions available, such as, complete, self-propagating or progressive inflammation. The English language has not broken down, nor has it been found inadequate that we should suffer ourselves to limp along with a poor philologic substitute like the word "explosion."

After all, it is a question of words and their definitions. We believe it was Lord Bacon, in his Novum Organum, who declared that disputations are as frequent over definitions as over facts. We hope that Mr. Burrell will modify his statements so that they will accord more closely with popular parlance, and declare that, on applying a light to a 5.5 per cent. mixture of methane and air, a complete inflammation or a self-propagating conflagration, and not an explosion, will result. Thus he will avoid confounding the violence of the latter with the gentle action of the former.

DISCUSSION BY READERS

Reducing Ventilation at Firing Time

Letter No. 1.—I have been much interested and startled at times in reading the phenomenal experiences of Alexander McAllister, Croweburg, Kan., as narrated in his letter, COAL AGE, Jan. 4, 1913, pp. 24 and 25. The statements set forth seem very convincing. Although such an experience is forbidden the majority of mining men, I am sure all would welcome the chance to be allowed to witness such a demonstration as Mr. McAllister cites in his letter.

The old proverb, "An honest confession is good for the soul," gives me consolation, when I say candidly, I would be afraid to perform such operations as he has described, in a gassy mine. It may be said with candor that his experience and convictions are contrary to or directly the reverse of those of practically all mining men and theorists alike, to whom we have looked and on whom we rely to furnish us facts, figures and experiences, for our guidance.

I have had nearly thirty years' experience, in all sorts of mines, having served in every capacity, but have never heard of such a scheme as that suggested. My opinion is that it would be a costly experiment to perform in a well equipped mine. I do not think the property and equipment of any mine should be jeopardized by such an experiment.

Personally, from my own experience and from that of tutors and the best authorities—men who have spent almost half a century studying mining conditions—I would condemn the practice of reducing the ventilation in a mine at firing time. I firmly believe such a method of procedure is extremely dangerous. To reduce the ventilation would increase the danger in the same proportion as to increase the quantity of explosive gas in the mine.

By reducing the ventilation, we increase the percentage of firedamp in the air, as the same quantity of gas is given off and a less quantity of air circulated. The percentage of dust is also increased and likewise the percentage of carbon monoxide produced by the explosion of powder in blasting. From these conditions it follows:

1. Percentages of gas that are not previously explosive become explosive in proportion as the volume of air is decreased.

2. Percentages of gas that are not previously explosive become explosive under the pressure of heavy blasting in a confined space where the air is dead.

3. The reduced air current will carry a large per cent. of dust, which will greatly help to propagate the flame of an initial explosion, and the danger point in respect to dust will be in proportion to the reduced ventilation.

If we knew the exact amount of gas given off in the mine, we might, with some security of feeling, estimate the quantity of air that should travel, but this is not possible. Nor can any exact estimate be made of the amount of carbon dioxide (CO_2) that would render the firedamp inexplosive. Authorities state that 1 volume of carbon dioxide (CO_2) when mixed with 7 volumes of firedamp at its most explosive point renders the latter inexplosive.

I shall watch this discussion with interest. It is an important subject, and until I was firmly convinced that I was wrong, if I were a shotfirer on my rounds and discovered a weakness in the air I would cease firing and ascertain the cause and would not commence again until conditions were normal.

R. Z. VIRGIN.

Johnstown, Penn.

The Hastings Explosion

A great deal of prominence is given in COAL AGE, Nov. 30, 1912, p. 756, to the explosion at Hastings, Colo., June 18, 1912; and it would appear from that article and the one by Mr. Verner, Nov. 16, p. 677, that the theory that damp dust or wet zones will stop an explosion is at fault.

It is difficult for me to conceive how anyone can arrive at such a conclusion, in view of the dust experiments made at Pittsburgh, Penn. In those experiments, the propagation of flame by coal dust ceased when the moisture content in the air reached 30 per cent. The coal dust, in the Hastings explosion was damp but not wet; still the writers of these articles refer to that explosion as proof that moisture cannot be depended on to stop an explosion. In reply to this statement, these writers may claim that, in the experiments at Pittsburgh, the explosion was not sufficiently under way when it reached the coal dust zone in the entry. If that line of argument is followed, then it is possible to suppose a case in which the initial force generated by an explosion of gas, or both gas and dust, would pass the flame through a zone of either stone dust or moisture, or both combined. I do not mean to say that either of these writers would dispense with moisture entirely, as a means of preventing explosions. but I think they are in error when they say that it cannot be depended on to do this.

I have worked in the Hastings mine, and know something of the conditions existing there. When there was only the upper seam working, the mine was naturally wet throughout, and small explosions that occurred failed to go further than the point of ignition. I held the opinion and expressed it to others that it was the naturally wet state of the mine that had localized these explosions. These considerations and the fact that the explosion in June, last, did not enter the main-intake airway where there was a running stream of water and where the props and everything else were saturated with moisture, leads me to the conclusion that the theory that the presence of moisture in coal dust will effectually stop the propagation of an explosion is correct.

I pointed out to Mr. Dean that there was not the least sign of an explosion on the intake; to which he replied that there was no dust being thrown into the intake from the cars, as there was on the main-haulage road. While that is true, by cars is not the only way that dust is

spread through mines. The crushing and grinding action of the overlying strata on the pillars produces a great deal of very fine dust, which is likely to be deposited all over the mine irrespective of the haulage roads; and besides, at Hastings there was one haulage road, at least, that crossed the intake, and there was also a side track from which the dust had access to the intake. I was much impressed with the amount of fine dust there was in the crosscuts and which was much disturbed when putting in new stoppings. I am of the opinion that had it not been for the running water in the intake there would have been enough of dry dust there to have carried the explosion to the surface.

The new-slope south entries do not show the same amount of moisture or standing water on the roadways that the entries of the old upper seam did, and therefore the new workings, in the lower seam, could not be expected to be immune from dust explosions to the same extent as the old mine in the seam above.

It seems probable that the greatest force of the explosion was exerted at the upper end of the main-slope side track. It was here that the cars were so badly broken up. A trip of cars standing about halfway up the slope and in the path of the explosion did not seem to be much damaged, although they were surrounded and covered with rock and loose timber. From what has been said it seems likely that the explosive force was generated from a little pocket of gas in the third south entry, and augmented, later, by dust picked up on that entry and the large side track at the end of it. From here the explosive force decreased, as is clearly shown by the fact that a man working near the top of the slope was found still alive. It is well known that a dust explosion will always travel the intake road if it can get any thing to feed on and avoid a wet road. The point of expansion referred to by Mr. Dean unfortunately is above where the man was found alive, showing that the blast had lost a great deal of its power before it reached that point.

The greater area of the road would reduce both the velocity and energy of the explosive wave, but the flame could easily have jumped across this space had conditions been favorable. Immediately beyond this point, where the area of cross-section of roadway expanded, is the last evidence of the force of the explosion, on the outby end; and here begins the naturally damp and sloppy condition characteristic of the old mine. It is here, I believe, the explosion was stopped from entering the upper seam; and I ascribe the credit for this to the very wet condition existing there. For hundreds of feet on the outby end of this point the damp conditions are very much in evidence. In some places, pools of water, from four to six inches deep, are found in the manway. When these things are considered I think it would have been a surprise to any of us had the flame of the explosion traveled beyond this point. Cases have been known where the mine was dry and dusty and the explosion traveled through the shaft from one seam to another without losing its explosive force; although there would be more room for expansion, at the shaft bottom and in the shaft, than there was in the Hastings slope.

An important factor, in connection with dust explostons, which should not be forgotten, is that, owing to the difference in the amount of energy and heat developed by different explosions, in different mines, a zone of moisture and stone dust that would stop the propagation of an explosive flame in one mine, might not stop it in another; because of the greater heat and explosive force. It is reasonable to suppose that if it required a zone of 100 yd. of moisture and stone dust to stop the propagation of flame in one mine, then it would require a zone of perhaps 200 yd. to stop the flame in another mine where the explosion had developed twice the amount of heat and energy. In the latter case, the greater velocity of the blast would carry it further into the zone, before the moisture and stone dust could cool the gases sufficiently to extinguish the flame, and the greater amount of heat in the flame would be able to convert some of the moist dust into gas, which would help to extend the explosion.

From this it is clear that a mine in which the analysis of the coal shows a high percentage of volatile combustible matter would require more attention and the stone dust and moisture have to be kept closer to the working places, than a mine in which there was less volatile matter in the coal. Referring again to the intake airway, I would like to ask: If the moisture did not stop the explosion from traversing it, what did? The flame had to cross the intake to enter the third north, and the pumper was found in the intake just below this point badly burned, which shows that the flame was there and had plenty of power behind it; but the naturally wet condition of the airway stopped it there, although it traveled up the parallel entry about a quarter of a mile further. It may be well to explain that the third-south entry is driven at right angles to the intake and main slope, so that it received little benefit from the water that was in them. This explosion was a particularly unfortunate occurrence, because the officials of the Victor American Fuel Co. had been paying a great deal of attention to the safety of their mines, by the application of adobe dust, water and other means, some of which were pointed out to me by the superintendent when he took me through the mine shortly after the explosion.

ROBERT MCCUNE.

Delagua, Colo.

Timber for Framing

I have been asked which is the stronger, a square solid piece of timber 12 by 12 in., 20 ft. long, or six pieces of 2 by 12 in., 20 ft. long, spiked or bolted together. These six pieces make a post or stringer of the same size as the single piece first mentioned.

There is no difference in the strength of the two pieces, except what little strength may be lost by the penetration of the spikes or bolts into the wood. This slight loss in strength, however, is generally compensated by the ability to choose good clear-grained pieces of the smaller sizes. The timber is less expensive than the larger size, and the latter may contain hidden knots or imperfections in the grain that are not observed on the surface, which weaken the stick.

The combination of smaller sizes of timber is often preferred not only on account of the saving in the cost of the timber, but the pieces are more readily handled.

When a stringer is formed of several small pieces of timber bolted together, they should always be set on edge, or with the greater dimension corresponding to the depth of the beam.

MINING ENGINEER.

Clermont, Penna.

INQUIRIES OF GENERAL INTEREST

Surveying Methods

Please explain an approximate method of measuring the distance across a stream, by the use of a transit and tape or chain; but without reference to any book of tables.

MINE SURVEYOR.

Stotesbury, W. Va.

First Method—Where it is possible to cross over the stream, the following method may be used, which will give approximate results: Referring to Fig. 1, set up the instrument at *A* and sight to a point *B*. Then, by means of the 3, 4, 5 method, often called the 3, 7, 12 method, set off the right angle *OBT*. To do this, first line in the point *O*, on the line *AB*, with the instrument, making the distance *OB* 3 ft. or any multiple thereof, and place a surveying pin at *O*. With *B* as a center and a radius of

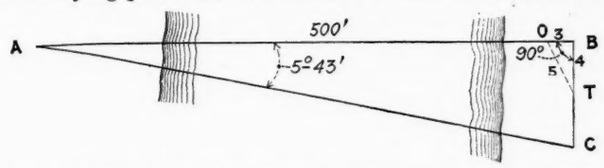


FIG. 1. METHOD OF MEASURING DISTANCE ACROSS A RIVER

4 ft., describe an arc; and with *O* as a center and a radius of 5 ft., describe another arc intersecting the first at *T*. The angle *OBT* will then be a right angle.

By the 3, 7, 12 method, the end of the tape is fastened at *O*, and the tape is then carried around the triangle *OBT* and back to *O*. The distance around the triangle *OBTO* is 12 ft. Now, holding the end and the 12-ft. mark at *O*, with the 3-ft. mark at *B*, pull out the tape with a pin at the 7-ft. mark, which will establish the point *T*, making the angle *OBT* a right angle.

With the instrument at *A*, turn off the angle *BAC* equal to 5 deg. 43 min., and line in the point *C* on the line *BC*. Now, since the tangent of 5 deg. 43 min. is 0.1, the distance *AB* will be ten times the distance *BC*. Thus, if the distance *BC* equals 50 ft., *AC* will be $10 \times 50 = 500$ ft.

Second Method—When it is not possible to cross to the opposite side of the stream, the following method can be used: Referring to Fig. 2, establish the line *CD* more

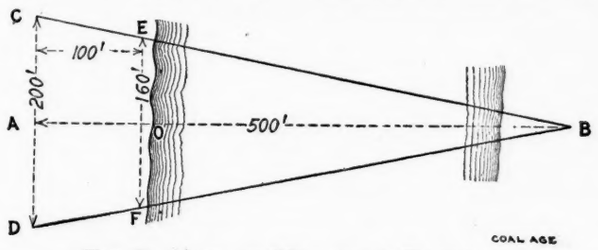


FIG. 2. ANOTHER METHOD OF SURVEYING

or less parallel to the stream, and another line *EF* parallel to the first, and at any distance *AO* from it. Now, select a well defined point or object *B*, on the opposite bank and line in the point *E* on the line *CB*, and likewise the point *F* on the line *DB*. Measure *CD* and *EF* carefully. The distance *AB* is then calculated as follows:

$$AB = \frac{CD}{CD - EF} \times AO$$

If the several distances are as indicated in Fig. 2, the calculation is as follows:

$$AB = \frac{200}{200 - 160} \times 100 = \frac{200}{40} \times 100 = 500 \text{ ft.}$$

Discharge of a Mine Siphon

A siphon pipe 4 in. in diameter and 1000 ft. long has a rise of 15 ft. and a fall of 40 feet. How many gallons of water will this siphon discharge in 24 hours?

HENRY HENNESSEY.

Stauffer, Penn.

In ordinary mining practice, the coefficient of friction of water flowing through a siphon pipe may be taken as 0.01. On this basis, the flow of water in a 4-in. siphon pipe, 1000 ft. long, rising 15 ft. and falling 40 ft., may be calculated by the following formula:

$$G = 4^2 \sqrt{\frac{800 \times 4\ (40 - 15)}{1000 + 2.08 \times 4}} = 142.4 + \text{gal. per min}$$

The quantity of water this siphon will discharge in 24 hr. is, then, $24 \times 60 \times 142.4 =$ say 205,000 gal.

In siphon work it is never safe to calculate the discharge of a siphon, by any formula, unless it is positively known that the flow of water, under atmospheric pressure, in the suction end, is equal to or greater than the discharge, under gravity, in the other end of the pipe. If the flow in the discharge end due to gravity is greater than that in the suction end due to the pressure of the atmosphere, the pipe will tend to empty itself; and sooner or later the siphon will cease to work or, in other words, will "run dry." Since it is the atmospheric pressure that causes the flow in the suction end of the siphon, and this decreases with the elevation above sea level, it is evident that a siphon that will work at sea level will often fail to work at an elevation above sea level where the atmospheric pressure is less. In order that a siphon shall work continuously, the value of the following approximate expression must be greater than zero:

$$\frac{\text{Atmos .head} - \text{suc. head}}{\text{Length of suc. end}} - \frac{\text{dischg. head} - \text{atmos. head}}{\text{Length of dischg. end}}$$

The normal atmospheric pressure, at sea level, expressed in water column, is 34 ft. Assuming the siphon, in this case, is located at sea level, the suction head being 15 ft. and the discharge head 40 ft., gives

$$\frac{34 - 15}{400} - \frac{40 - 34}{600} = \frac{19}{400} - \frac{6}{600} = 0.0375$$

This value being greater than zero, shows that the siphon will operate continuously without emptying itself, provided, of course, that both ends are submerged and other necessary conditions fulfilled.

EXAMINATION QUESTIONS

Mine Foremen's Questions

(Answered by Request)

Ques.—Two pumps are working together, the one 14x36 in., and the other 15x30 in. If both of these pumps are running at a speed of 90 ft. per min., which will throw the greater amount of water per hour; and how much will the discharge of the one exceed that of the other?

Ans.—For a piston speed of 90 ft. per min., the piston displacement of each pump is as follows:

Pump, 14x36 in.

$$\frac{90\ (0.7854 \times 36^2)}{144} = 636.17 \text{ cu.ft. per min.}$$

Pump, 15x30 in.

$$\frac{90\ (0.7854 \times 30^2)}{144} = 441.78 \text{ cu.ft. per min.}$$

Since 1 cu.ft. of water equals 7.48 gal., and assuming the water-end of each pump has an efficiency of 85 per cent., the quantity of water discharged per hour by each of these pumps is as follows:

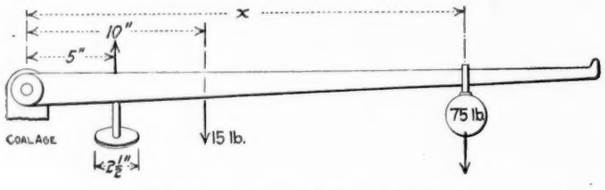
$$0.85\ (636.17 \times 7.48 \times 60) = 242{,}686 \text{ gal. per hr.}$$
$$0.85\ (441.78 \times 7.48 \times 60) = 168{,}530 \text{ gal. per hr.}$$

Difference ..... 74,156 gal. per hr.

At a speed of 90 ft. per min., the 14x36-in. pump will, therefore, throw 74,156 gal. per hour more than the 15x30-in. pump will discharge, at the same speed.

Ques.—In a ball-and-lever safety valve, the distance from the fulcrum to the valve stem is 5 in.; the diameter of the valve, 2.5 in.; the weight of the lever, including that of the valve and stem, 15 lb. and its center of gravity, 10 in. from the fulcrum. If the ball weighs 75 lb., how far should it be set from the fulcrum in order that the valve will blow off at 90 lb. per sq.in., boiler pressure.

Ans.—Referring to the accompanying figure, there are two forces acting downward, namely, the weight of the



BALL-AND-LEVER SAFETY VALVE

lever and valve and the weight of the ball. The weight of the lever and valve acts through the center of gravity, which is 10 in. from the fulcrum; while the weight of the ball acts through a distance x from the fulcrum, which distance is to be determined.

These forces acting downward are balanced by a single force acting upward; namely, the total steam pressure on the valve. This force acts through the valve stem, at a distance of 5 in. from the fulcrum. The steam pressure on the valve is first found as follows:

Area of valve $= 0.7854 \times 2.5^2 = 4.9087$ *sq.in.*

Then, for a steam pressure of 90 lb. per sq.in., the total pressure on the valve is:

$$4.9087 \times 90 = 441.78 \text{ lb.}$$

At the moment when the valve blows off, there is equilibrium between the forces acting downward and that acting upward. Since the fulcrum is the center of moments about which these forces act, the sum of the moments of the downward forces must equal the moment of the upward force. Therefore, calling the distance from the fulcrum to the ball, x

$$75x + 15 \times 10 = 441.78 \times 5$$

$$x = \frac{2208.9 - 150}{75} = 27.45 \text{ in.}$$

In order that this valve shall blow off at a steam pressure of 90 lb. per sq.in., the ball must be set 27.45 in. from the fulcrum.

Ques.—If the separation doors at the bottom of a mine shaft are set open, so that the air current short-circuits at this point, passing down one shaft and up the other without circulating through the mine; will the fan run faster or slower as a result?

Ans.—The opening of the separation doors at the shaft bottom and the consequent short-circuiting of the air current, cuts out the mine resistance. As a result, a larger quantity of air is circulated by the same power applied to the fan. This means a larger volume of air is passing through the fan and the two shafts per minute. The resistance of the fan and the work lost in the fan is increased. The effective power or the power available to turn the fan will therefore be decreased, and the fan will naturally run slower. How much the speed of the fan will be decreased will depend upon the relative resisting power of the mine and that of the fan, in connection with that, also, of the two shafts and the airways connecting them.

Ques.—Does dynamite exert a greater force downward, or does it exert the same force equally in all directions?

Ans.—In the explosion of dynamite the cartridge is the center of a radiating force, which is exerted equally in all directions. The reason for the statement so often heard that dynamite exerts its greatest power in a downward direction is probably due to the fact that the cartridge or stick of dynamite is supported from below, and the force of the explosion is more in evidence in this direction, owing to the destruction of the support.

The explosion of dynamite is so sudden and violent, that it is only necessary to lay a stick of this explosive on the upper surface of a rock or boulder, and its explosion will generally break the boulder. Sometimes a handful of sand or earth is placed over the cartridge to keep it from rolling away before the explosion takes place. However, if the dynamite could be held against the under surface of the boulder or any other obstruction, its explosive force would be manifested as strongly in an upward direction as it was previously manifested in a downward direction.

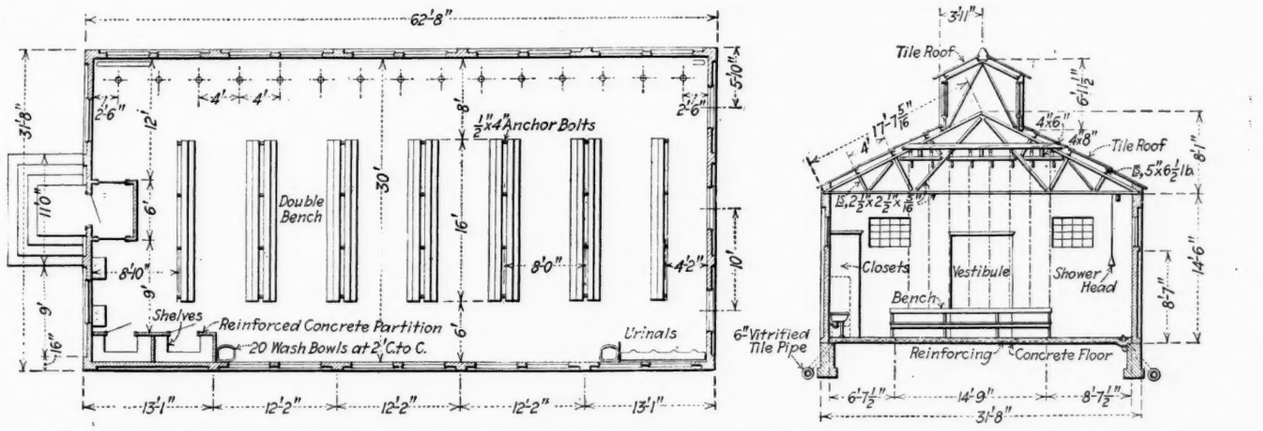
SOCIOLOGICAL DEPARTMENT

Bunsen Miners' Change and Bath House

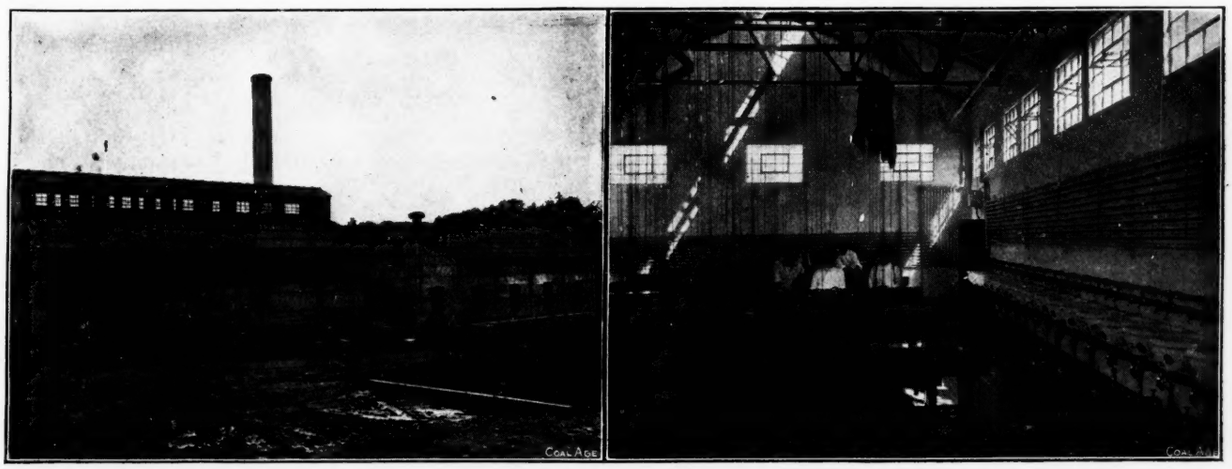
By A. F. Allard*

The miners' change and bath house provided by the Bunsen Coal Co., at its Universal Mines, situate near Clinton, Ind., is in close proximity to the shafts, and of pivoted windows placed on each side of the monitor, running throughout the length of the building. These windows are opened and shut from the floor by a hand-operating device.

The entrance to the building is provided with an outer and inside vestibule, the men passing from the latter through swinging doorways on either side. This feature prevents cold drafts from entering the building



Plan and Sectional Elevation of Bath House of Bunsen Coal Co., Universal Mines, Clinton, Ind.



Exterior and Interior Views of Bath House at Universal Mines, Constructed of Reinforced Concrete with Steel Window Frames and Cement Tile Roof

measures 31 ft. 8 in. in width by 62 ft. 8 in. in length. The floor and walls are of reinforced concrete; the roof covering is of cement tile, supported on steel trusses, and the window frames are of steel, making the building absolutely fireproof. It was designed by the Roberts & Schaefer Co., of Chicago.

At the present time, there are about 200 miners employed, out of which number about 75 per cent. make use of the bath house. Ventilation is provided by means and chilling the stripped men. A row of shower heads is located on the side opposite the washbowls, but it is not shown in the illustration of the interior. Near the entrance, two concrete closets are fitted up with shelves and hooks for the personal use of the mine managers.

The heating system consists of steam-heat coils made up of 1¼-in. pipe, in ranges of 11, supported along the side walls and the end of the building. The pipes are supplied from a high-pressure steam line and a comfortable temperature is maintained at all times. The hot-

*Chief engineer, Bunsen Coal Co., Westville, Ill.

water supply is drawn direct from a hot-water heater located in the boiler house, insuring a sufficient supply.

Along the bath side 15 shower heads are placed at 4-ft. centers and 7½ ft. above the floor. They are supplied with hot and cold water, the temperature being regulated by means of hot- and cold-water valves within easy reach of each man.

On the lavatory side there are 20 individual enameled washbowls, each supplied with a hot- and cold-water spigot. The urinal is on the same side and located at the extreme end of the house, but screened from general view by a slate partition. It is 8 ft. long and is fitted with a tank and pipes for flushing and sprinkling.

The concrete floor slopes 5 in. from the center to the gutter, permitting the water to drain off quickly. Brass bee-hive strainers placed at intervals along each gutter carry off the waste, which leads through pipes and traps to the drainage sewer. After each shift of men has used the bath house, a caretaker, paid by the company, washes down the floor, cleans the benches and wash bowls, keeping the house clean and sanitary.

Wooden benches fastened to the floor are placed in pairs back to back. They are 16 ft. long and spaced 8 ft. apart, allowing ample room for the men to walk between and around the seats. The men's clothes are suspended between the roof trusses by means of a 12-in. diameter brass ring with chain attached, operating on a pulley fastened overhead. When the clothes are hoisted into position, they are held in place by securing the chain to a padlock fastened to the back of the bench. The locks are in combination, each man carrying his own key.

Clothing thus suspended is well ventilated, and quickly becomes dry. The arrangement has an advantage over lockers placed on the floor, because no additional floor space is required. The method adopted for handling the clothing proves satisfactory to the men, enabling them to wash and change their clothing in a short time. In the view of the exterior of the bath house, another building is included on the left; the bath house can easily be distinguished by the monitor or clerestory in the roof.

Sociological Development in 1912

By R. Dawson Hall

SYNOPSIS—The work of the subsidiaries of the United States Steel Corporation has attracted much attention and will doubtless result in a great development of sociological work of all kinds. The South leads in the consideration of health, the anthracite region in the matter of institute work and first aid. The Steel Corporation leads the country in almost all forms of welfare work except in the organization of institutes.

The sociological development of 1912 is perhaps one of its most remarkable features. The work of the United States Steel Corporation at its many plants seems one of the dominant facts of the year but, as a matter of fact, the public announcement and the development of its work are about all which can be credited to the year just passed. The year before last it let an account of its plans to promote safety appear in the public press and last year it permitted the public to learn how much had been done to make its villages sanitary and picturesque.

But the greater part of the work is older than these records as the companies have been anxious to test the issue of the work before giving the public an account of it. The paper of Thomas W. Dawson at the winter meeting of the Coal Mining Institute of America best describes the work of the H. C. Frick Coke Co. Many, but by no means all, the pictures which illustrated that lecture have appeared in Coal Age. What is true of the Frick company is no less true of the United States Coal & Coke Co., another branch of the Steel Corporation.

Profits and Ethics

Suffice it to say that the Steel Trust is proving the statement of an Ohio coal operator published as a foreword that so long as we have a cut-throat competition in the coal business we cannot expect to have a truly ethical vision of the duties of operators to working men. The companies which lead today in sociologic work are the large steel corporations and the anthracite coal companies.

In relation to the first it will be recalled that at the summer meeting of the Coal Mining Institute of America, two of the officials of the Cambria Steel Co., M. J. Moore and H. S. Endsley, advocated reforms in the mining industry. The first urged the necessity for bathhouses and the second spoke in favor of making accident compensation free from the defence of contributory negligence.

Playgrounds in Colorado

But while all eyes are directed to the H. C. Frick Coke Co., due credit should be given to the Rocky Mountain Fuel Co., which is showing a commendable spirit in constructing playgrounds. We show an illustration of their mines at Superior, Colo. Careful inspection will show in the foreground a playground with a large swing and some sliding boards. Such places of recreation can be found at all the operations of the company, of which there are nine in northern Colorado and about the same number in the southern part of the state.

Only one of two houses can be seen in the picture, but this Superior camp is considered to be one of the best looking and cleanest villages in the state. There are 30 houses; some have four rooms and some five or six. There is a good boarding house with 75 rooms. All the dwellings are lighted by electricity and supplied with artesian water.

A good bathhouse supplied with hot water is provided. Fortunately, Superior has good connections, being on the main line of the Colorado and Southern railroad. The Denver and Interurban R.R. runs electric cars to Denver and Boulder every two hours. With such provisions for comfort, the Rocky Mountain Fuel Co. should have no shortage of men.

The Southern Operators Fighting Disease

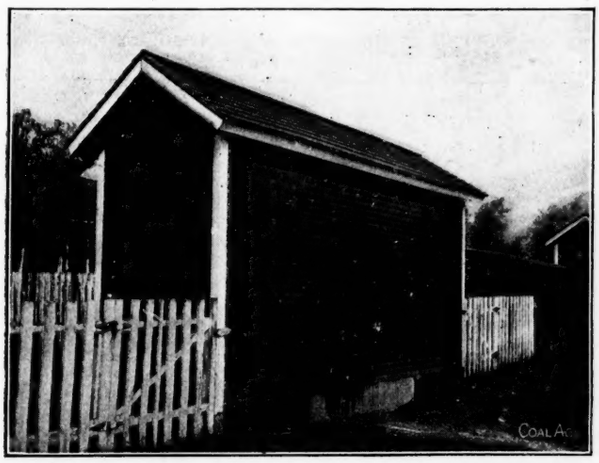
In the South, a large interest has centered around sociological work. Disease which makes little headway in the colder climate of the North is rife in Southern camps,

and the Alabama Coal Operators' Association determined to cope with it and employed two experts to advise the operators as to prophylaxis and printed several pithy pamphlets on disease prevention. At the Kentucky Mining Institute, a paper was read on the hookworm.

Little on these lines has been done in the North, but it is not unlikely that the lead of the South will ultimately be followed. The H. C. Frick company has done good work by constructing concrete cesspools under their privies. In fact, the Frick company has paid as much attention to sanitary needs as to mere comforts and aesthetics.

First Aid Occupies New Territory and Intrenches Itself in Old

First-aid work has had a large development. The work of the Red Cross Society was spread so thin over so large a field of industrial work that the addition of Dr. R. N. Mackey as an assistant to Dr. M. J. Shields was



An Alley in an H. C. Frick Coke Co. Town, Showing Privy Vault

imperative. He has been doing a good work in the Southern States.

Kentucky has hitherto not been active in first-aid work but under the influence of W. L. Moss, the general manager of the Continental Coal Corporation, much is hoped from the coming year. The doctors are now at one in aiding the movement, their hostility being replaced by skillful direction since first-aid work has proved its value.

First-aid meets have been held from one end of the country to the other and have been most successful, especially in the anthracite region where there is a clear understanding as to the marking of the judges. In the bituminous region, the umpires are biassed by their private preferences as to methods. As the contestants coming from a distance have no knowledge of these preferences, a slight injustice is sometimes done in giving demerits with considerable disadvantage to a team near the lead when the final count is made.

The Debate on Methods

The time element in first-aid work is not as popular as before. Where it is still maintained, the time is made so ample that it really does not have any importance in judging the results. In some cases no limit at all is provided.

There is marked difference in view as to the relative value of elaborate and rough dressings. The Philadelphia & Reading Coal & Iron Co. is an advocate of the most careful and elaborate dressing of patients. But it must be remembered that the success of the Reading teams is due to the fact that they are well trained. It would be worse than useless to advocate such work where the men were not likely to get such continuous training or were not disposed to assimilate it.

The Coal Mining Institute of America and the Tennessee Association of Mine Foremen have each promoted first aid by holding a meet at their summer sessions and the Kentucky Mining Institute proposes to follow with one next year. The work is, however, alien to the purposes of these institutes and will probably be dropped by them after the work is well on its way. The time devoted to the reading of papers and discussion is all too short for work of any other kind to be attempted.

Doctors Differ, Yet All Are Right

The Bureau of Mines has developed a Mine Rescue and First-aid Conference which is expected to hold frequent meetings. The movement has been favorably received by the mining fraternity, but the doctors who met seem to have been obsessed with the idea that they ought not to have been there and did not become actively interested in the work at hand. This feeling is doubtless because first aid is a layman's movement.

It will take some time to overcome the unwillingness of the medical profession to assimilate it. But that acceptance will eventually take place and then the doctors will be prepared to meet and to discuss the issues as readily as they have hitherto considered other technical subjects in their medical societies. The very fact that all are not agreed is a reason for discussion. If all the practitioners of medicine and surgery had like views there would be no need for a conference. The remarkable stand is taken, however, that as no one agrees, it is well to avoid discussing the issues.

During the past year, some local hospitals have been built. One at Cle Elum, Wash., was started by the labor union. One at Pineville was built by the Continental Coal Corporation. That one has been in operation at Penn-Mary Mines for two or three years has already been noted. Evidence seems to point to a further development wherever a dense industrial population is planted in sparsely settled agricultural country where such institutions have not been provided.

Secularization of Institute Work

During the last year, the anthracite coal corporations have been taking over the institute work of the Young Men's Christian Association. This work, while conducted on a purely nonreligious basis, was not regarded by many as wholly unsectarian. For this reason, the companies believed it best before giving the movement their full support to separate the work from the association.

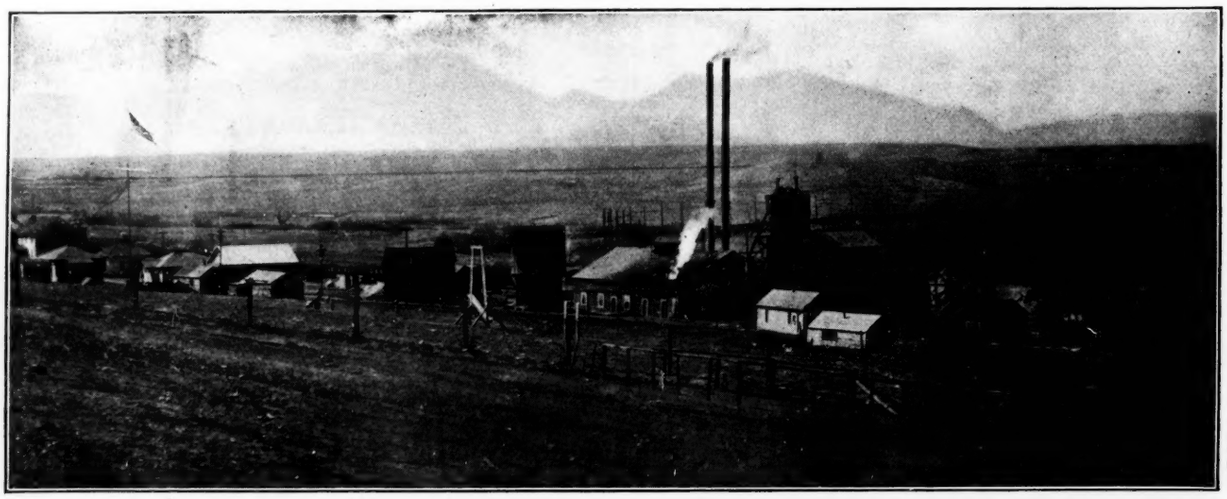
Whether because of the new *status quo* or from the renewed efforts of the operators, the institutes have been doing extremely valuable work. C. K. Gloman, of the Susquehanna Coal Co., has published an exceptionally useful booklet on methods to be adopted in the formation of institutes. The Panther Valley Coal Mining Institute, while perhaps not among the largest, is developing an exceptional amount of high-class literature.

All are doing a great deal to educate the younger men. Many of the classes are supplied with the textbooks of the American School of Correspondence, of Chicago, Ill., and the scholars are making remarkable progress. The Carbondale Mining School has, however, broken up, the attendance having fallen off.

The Bituminous Region Lags in Institute Work

It is to be regretted that the bituminous regions are far behind the anthracite in aggressive institute work. It should be noted here that C. L. Fay has resigned from the position he has filled most acceptably for so many years as organizer of the mining work of the Y. M. C. A. in the anthracite regions. He assures his friends that the work will not fail of success as it is now firmly supported by the coal companies and has borne enough fruit to assure the public of its value and practicability.

The school code of Pennsylvania permitting occupational schools is doing good work at Ellsworth and Nanticoke and probably in other places. E. E. Bach, of the first mentioned place, is the pioneer in such work



The Playground and Plant at the Industrial Mine of the Rocky Mountain Fuel Co., Superior, Colo.

In Pennsylvania a miners' compensation bill has been written by a commission appointed for that purpose and it is expected that in the coming year something will be done to enact it into law. The corporations having a firm footing are a unit in favor of some such legislation. The smaller are doubtless not so favorable, but the act will pass nevertheless and the provision will make for safety, if not for efficiency. Unless the act is carefully worded and honestly applied it will result in increased malingering.

Relation of Industry to Well Being

There has been some complaint that the miners of today do not desire to earn more than a minimum wage, that an increase of pay is always offset by a decrease of effort. If the mining villages of the country are improved so that the inhabitants of these backwoods towns can enjoy a sort of semi-urban life, it is probable that the standard of living will rise continuously with the rate of wages. Sidewalks, places of public entertainment and churches will tend in that direction and some further stimulus to pride of appearance will be derived from the building of washhouses at the mines. Farmers in villages where roads are bad, and sidewalks unknown drift into careless ways of living and attire, which low standard is immediately raised as soon as clothing is not exposed to so much unnecessary wear and tear.

The Bureau of Mines is securing a sociologist. Consequently, we may expect, in the year to come, that the bureau will spread the good work in other states which has been started in Pennsylvania. As its good offices have taken first aid from a restricted area and made it national, so perhaps we may in a year or two find that, owing to the bureau's work, institutes will be found in almost every large camp in the Union.

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A Fatal Mine Cave

The photo in a recent issue of Coal Age, showing the old Court-Wright House, at Courtdale, hanging over a cave hole, which swallowed up the heater in the cellar, sending it down out of sight into the workings of the old No. 1 slope of the Kingston Coal Co., reminds the writer of a similar but more disastrous cave in the mines at Stockton, about three miles east of Hazelton, on the night of Dec. 18, 1869. It occurred after midnight, when all were asleep, burying the house, a large double block, occupants and all; and to add to the horror of the occasion, the stoves overturned with the wreck, burning the bodies, which were never recovered. A marble slab was placed over the spot, bearing the names of the victims and dates of their births, as follows:

Elizabeth Rough,	1796
Margaret Rough,	1837
Isaac Rough,	1839
Elizabeth Rough,	1869
George Swank,	1819
William Swank,	1850

Later a neat iron fence was built about the inclosure, and within it stands several weeping willows, the mountain winds whistling in common sympathy with their drooping leaves.

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A "self-rescue" apparatus has been recently placed on the English markets. It is intended to be kept below ground ready for use by miners threatened by fire or bad air. Incased in this apparatus the miner could live for at least one-half hour, which would allow him to make his escape to some ventilated part of the mine.

COAL AND COKE NEWS

WILKES-BARRE, PENN.

Trouble is expected at many collieries in the anthracite field after Feb. 1. On and after this date, miners in District No. 1 are supposed to refuse to be lowered into the mines if the engineer at the colliery is not a member of the miners' union.

The decision to enforce a rule of this sort was reached at a meeting of the grievance committee of the district, which was held at Plymouth. President John T. Dempsey was not present at the meeting, and he has made a statement in which he says that such action cannot be taken because it would be in direct violation of the working agreement between miners and operators.

Despite this the miners declare they will refuse to ride on any carriage which is operated by an engineer who is not a member of the miners union. Such a decree is virtually a strike order, for the refusal to ride on a mine carriage not operated by a member of the miners' union would mean that the operation would be forced into idleness.

Mine leaders are putting forth their best efforts to prevent the men from carrying out such a threat, but the spirit of the miners just now is that every man about the colliery must be forced into their union. and this desire for a closed shop is backed by an agitation that is hard to control.

Hoisting engineers in the anthracite region have other troubles aside from those relating to the union. The proposed mine code of the state, which has been drafted and is now receiving the consideration of the mine code commission, provides that an eight-hour day be given to only those engineers at collieries where more than 200 men are employed.

The engineers have taken up the battle against proposed legislation of this sort, and are advocating that instead of placing restrictive amendments on the state law, it should be altered so as to extend to all hoisting engineers, for there are many who, besides hoisting men, rock, or coal from one vein to another, have pumps and a fan to attend.

Appeals have been made to the members of the Mine Code Commission not to wipe out the eight-hour law for all engineers, which the last legislature placed on the statutes.

A Clean Place to Eat In

Officials of the Lehigh Valley Coal Co. have erected a mess house at the Prospect Colliery for the use of all outside men. Its value will be put to a thorough test, and if it is found to be of real benefit to the men, the system will be extended to every one of the Lehigh Valley collieries. Vice-President and General Manager F. M. Chase is deeply interested in the scheme, and is watching it carefully, believing that the mess house will fill a long-felt need of the men who are employed outside at the collieries.

The mess room provides a clean place for the men to eat their meals. Sufficient room is given for all men employed on the outside. It keeps them away from the dirt and dust of the breaker, gives them comfort from bad weather, and provides the means for a pleasant chat while the meal is being enjoyed.

The rooms will be so arranged that during their noon hour the men may read and smoke, discuss any topics they desire, and get a period of rest that will be beneficial to them for the afternoon's work.

Hot and cold running water is provided, and there are benches and tables for the use of all employees.

PENNSYLVANIA

Anthracite

Pottsville—An accident at the McTurk colliery at Girardville resulted in a mine car being hoisted over the sheave. It fell and landed in the engine house. It was several days before work was resumed.

Incendiaries set fire to the barn of the Reading company at the Otto colliery, Branchdale, Jan. 3. It is believed that the object was to handicap the operation of the mine.

Scranton—T. Ellsworth Davies, the mining engineer engaged by the county commissioners to ascertain and report to them the quantity of coal in Lackawanna County that should be subject to assessment, will make his report this week. Mr. Davies, among other things, has been asked to enlighten the commissioners as to the total squeezed area in the county that is now exempt from taxation. In his report, Mr. Davies will set forth that there is between $2,000,000 and $3,000,000 of coal in the county that is being freed from taxation under the name of squeezed and unminable coal. He contends that all of this coal is not only minable, but being mined; and that coal companies are now working in places that are reported as being squeeded and worthless. In his report he will explain his reasons for declaring this coal accessible, and further will advise that the assessment value be increased from $150 to $300 per foot-acre. At the last triennial assessment the county commissioners increased the assessed valuation of coal from $67.50 to $150 per foot-acre. Appeals were filed from this valuation, but later the coal companies accepted it.

Wilkes-Barre—The strike of Lehigh Valley Coal Co. employees at Yorktown has been amicably settled and work resumed. The strike was caused on account of the miners' claim that not enough cars were furnished them under existing conditions to allow them to make a living wage. Superintendent Davies held a conference with the men and decided to abandon the hoisting of coal in No. 1 slope at Yorktown, and hereafter all coal mined in this district will be run underground to the Jeanesville operations and prepared at the Jeanesville breaker. By this plan the men can get more cars, and No. 1 Yorktown slope will be used only for the lowering of timber and hoisting of rock.

The North End Coal Co., of Scranton, proposes to take an appeal from the decree in favor of the Delaware, Lackawanna & Western Coal Co., to the Supreme Court. By the decree of the local court, the North End company was directed to forfeit leases and contracts to two tracts in North Scranton, and to pay the plaintiff $46,528.59 damages for alleged mining of coal not conveyed in the lease.

Bituminous

Washington—Martin Williams, a fireman, lost his life Jan. 9 when a flywheel on a generator engine at the mines of the Clyde Coal Co., near Fredericktown, burst. The generator is a wreck and the engine room badly damaged.

Uniontown—While drawing coke from an oven at Orient Jan. 3 workmen were horrified to find the skeleton of a man. It is thought that the man may have been murdered and thrown into the oven.

WEST VIRGINIA

Charleston—Five hundred miners of the Four States Coal Co., at Dorothy, have struck. Several mines are tied up, and among them is one which has a contract to furnish 1000 tons of coal a day to the C. & O. R.R.

Rioting has again been resumed in the Paint Creek district. A coal train was shot up and the tipple of the Standard mine of the Supplint Coal Co. was set on fire.

ALABAMA

Birmingham—The semiannual examination will be held by the State Mining Board in the auditorium of the Chamber of Commerce, Jan. 21-24, according to a statement made recently by Chief Mine Inspector Nesbitt.

Newcastle, Ala.—The Pratt Consolidated Coal Co. will fire up the Milner Iron & R.R. Co.'s coke ovens at once, for the purpose of filling a 40,000-ton coke contract, which is to be delivered within the next six months. About 250 ovens will be placed in service, after a three years' idleness. This property has been recently acquired by the Pratt company. The contract is said to involve a sum of $250,000.

KENTUCKY

Louisville—The organization of the Du Pont Coal Co. with a capitalization of $6,000,000 is expected to take place not later than Feb. 1, when the Central Coal & Iron Co. interests will be merged, it is said, with 30 smaller coal-mining companies in western Kentucky. About 20 of these smaller companies already have signed articles binding them to participate in the merger, according to reports. They will receive besides bonds securing the entire value of their property turned over, 40 per cent. of this value, as agreed upon by both sides in new stock the proposed company will issue.

The new company is said to be planning to issue $3,000,000 of stock, of which it will own 60 per cent., and $3,000,000 of bonds. This merger is supposed to be only the preliminary to the forming of a larger merger later on.

Whiteside—A new variety of smokeless bituminous coal has recently been uncovered, according to a report from Whiteside, Ky., which is said to have been used in a test at Atlanta with entire satisfaction to the smoke inspectors, no smoke consumers having been used. The coal is mined by the New Etna Coal Co., and will be placed on the market as St. Anthony coal. The supply in sight is said to be abundant.

Madisonville—With Mine Foreman H. D. Mason and a crew of expert miners in charge, United States Bureau of Mines Safety Car No. 3 is at Madisonville, Ky., for a week's stay, demonstrating the most approved methods of handling coal and of preventing accidents in mines. From Madisonville the car will proceed to Earlington and other western Kentucky points.

OHIO

Pomeroy—The floods which raged on the Ohio River recently caused practically all of the mines in the Pomeroy Bend district in Ohio to close down. One mine was operated and that was a mine belonging to the Maynard Coal Co., which was a considerable distance back from the river. Considerable damage was done to property in that mining district.

East Liverpool—There is a well defined rumor circulating in Wellsville to the effect that the Pennsylvania R.R. Co. will soon extend the Powhatan branch of the C. & P. division to a point near Martinsville, W. Va., bridge the Ohio River and extend the line through undeveloped coal fields in West Virginia.

Columbus—The United States circuit court has decided that the merger of the Hocking Valley with the Toledo & Ohio Central and the Kanawha & Michigan R.R. and other coal companies is illegal and must be dissolved.

It is expected that the Ohio state legislature will pass a bill compelling operators of coal mines to pay their men on the run-of-mine basis. The operators of the state will oppose the law with every obstacle they can invent.

INDIANA

Terre Haute—The leaders of the Mine Workers of Indiana are canvassing the vote for district officials this week. The term of office will be for two years for the first time and will begin April 1. It is generally conceded that William Houston will be elected president and that Charles Fox will be reëlected secretary.

Evansville—A fire has been raging in the Elberfield coal mine since Dec. 27. The opening of the shaft has been covered with timber and dirt to smother the fire. It is feared that the loss will be heavy. The mine employs 85 men.

ILLINOIS

Greenfield—The large coaling station buildings of the Chicago & Alton R.R. were burned Jan. 3. The origin of the fire is not known. Loss $15,000.

Streator—On Dec. 31 B. E. Parcher filed an injunction in the circuit court of LaSalle County against the Harrison Coal Co., restraining them from obstructing the flow of a small creek which runs through his land, and thence to the Vermillion River, Parcher claims that the obstruction of this creek deprives him of his right of drainage.

MISSOURI

Joplin—Six hundred and fifty miners, employed in the five mines of the Wear Coal Co., went on strike, Jan. 4, because the officials of the company refused to discharge the superintendent and the pit boss of No. 19 mine, as the men demanded. Officials of the company refuse to make any statement, except that they expect the men to return to work in a few days.

WISCONSIN

Superior—Fire, starting in the operator's cage of unloading rig No. 1, at the Carnegie coal dock, caused a damage to the apparatus estimated at $75,000.

WASHINGTON

Spokane—An extensive deposit of commercial coal has been discovered within ten miles of the heart of Spokane. The discovery has been made on a number of farms while digging wells, the workmen having cut through beds running from 10 to 20 ft. in thickness. Local and eastern capitalists have placed $250,000 on deposit in the Spokane banks to develop the find, should the pending negotiations with the owners of the land prove successful.

PERSONALS

Dr. de Holl will be succeeded by Mr. Harry M. Urban, new chief civil engineer of the Tennessee Coal, Iron & R.R. Co.

P. J. Friel, of Mahanoy City, has been appointed state mine inspector in the Shamokin district, to fill the vacancy caused by the death of Martin McLaughlin.

Henry R. de Holl, of Birmingham, Ala., assistant superintendent of the byproduct coke-oven department of the Tennessee Coal, Iron & R.R. Co., has resigned his position, effective Jan. 10, 1913, to accept the position of superintendent of the byproduct coke-oven department of the Inland Steel Co., at Chicago, Ill.

Arthur L. Ware, well known in the Kentucky and Tennessee coal fields as an engineer and machinery agent, has accepted a position with the Roberts & Schaefer Co., Chicago, and will represent them in this territory. The Roberts & Schaefer Co., through Mr. Ware, solicit the patronage of any coal companies contemplating building new plants or remodeling existing equipment.

John J. McNulty, who has been inside foreman at the Barnum Colliery of the Erie, has been transferred to the Butler Slope section of the Butler Colliery, and George V. O'Hara, who has been inside foreman on the Butler Slope workings, will have charge of the Barnum. Mr. McNulty is just recovering from injuries received in a cave in the robbing section of the Barnum Colliery.

OBITUARY

William R. Brasher, aged 33, assistant state mine inspector of Kentucky, died recently at the Norton Infirmary, in Louisville, following a surgical operation for a tumor. Mr. Brasher was brought to Louisville from Earlington, Ky., for the operation. He was unmarried, and is survived by two sisters.

CONSTRUCTION NEWS

Duluth, Minn.—The Pittsburgh Coal Co. has let contracts for two structures at its Dock No. 5, which is being rebuilt at Allouez Bay. The cost will be about $300,000.

Oak Creek, Colo.—The Yampa Valley Coal Co. is installing a plant for the manufacture of eggettes or briquettes. The machinery is valued at $50,000 and has been imported from France. It is now being erected in Denver.

Millsboro, Penn.—W. H. Flint, of Pittsburgh, has purchased a tract of 49 acres facing Black Dog Hollow and ground has been broken for a new coal plant. A modern tipple and plant will be erected, and the mine equipped with electricity.

Birmingham, Ala.—The Tennessee Coal, Iron & R.R. Co. is repairing and overhauling its Oxmoor Furnace, and will put it into blast about Feb. 1, after being idle since the fall of 1907. With this one in blast, every available furnace of this company will be at work.

Morgantown, W. Va.—The new mines of the Crucible Coal Co., near Rice's Landing, will soon be completed and it is believed that many miners will be put to work within a short time. Robert Holliday has been appointed superintendent of the Crucible company's works.

Nelson, Ky.—The Nelson Creek Coal Co., at Nelson, Ky., announces that it will rebuild its coal tipple, which was recently destroyed by fire, this time avoiding the possibility of any such mischance by making the construction fireproof. The mine has a daily output of 600 tons.

Centralia, Penn.—The Estey Coal & Mining Co., capitalized at $750,000, has been organized with the intention of starting, as soon as possible, actual development work on 500 acres of coal land recently transferred to them. The new company is an organization of Portland and Los Angeles capital.

Connellsville, Penn.—The Bellevernon Coal & Coke Co. has bought the Somers No. 1 mine, and proposes to erect 40 coke ovens. Twenty are almost completed and the others will soon be ready. The company intends to dig pillar coal for the present, as most of the solid coal has already been mined

Birmingham, Ala.—With temporary tipples and top houses in place, where the structure was burned a few weeks ago by a fire that did considerable damage, work has been resumed at the Banner mines, in the western part of the county. Something like 600 tons of coal daily will be attempted at the start.

Martin's Ferry, Ohio—The work of setting poles for the new high-tension electric power lines from the plant at Brilliant to this city is progressing rapidly. Mines between these two points will be the first to be supplied with current. A 2200-volt generator is being installed in the plant and it is expected to be in operation in a short time.

Pittsburgh, Penn.—The Cheat Haven & Bruceton Ry. has begun the construction of 8 miles of track along the bank of the Cheat River, from a junction with the Baltimore & Ohio's line in Fayette County, to Ice's Ferry, W. Va. The new railroad is backed by the Kendall Lumber Co., which has 25,000 acres of coal and timber land in the Cheat River tract. Frank Cunningham is president and chief engineer of the new road.

Bellaire, Ohio—The George M. Jones Co. is planning to develop its recently acquired territory along the Ohio & Western R.R., west of Bellaire, on an extensive scale. It has been learned that the company is planning to open at least 3 additional shafts on their property within the next year. The Pennsylvania R.R. Co. is running broad-gage cars on a siding from Wegee to the first opening, which has already been started.

Birmingham, Ala.—The Pratt Consolidated Coal Co. has leased the Montgomery County, Ala., convicts for the year 1913, paying $17 per month each in addition to maintaining and caring for them. The company will work them in their Flat Top Mine, where they will replace the Jefferson County convicts, who will be worked on the county roads after April 1, 1913. The Montgomery County convicts have for the past few years been worked on the roads and in lumber and turpentine camps.

Nashville, Tenn.—It is announced at Nashville, Tenn., that the Tennessee, Kentucky & Northern R.R., formerly known as the Overton County R.R., extending a distance of 16 miles from Algood to Livingston, Tenn., is to build south about 20 miles to connect at Sparta, Tenn., with the Nashville, Chattanooga & St. Louis Ry., and northward about 40 miles to connect with the Kentucky & Tennessee Ry. at Rock Creek, Ky., giving a short through route between Cincinnati, Nashville and Birmingham, and rendering accessible an immensely rich coal and timber section now untouched by railroads.

Knoxville, Iowa—More than $500,000 has been spent on the plant of the Indiana Consolidated Coal Co., in Dallas Township. It is estimated that the completed plant will cost little short of three-quarters of a million dollars. The shaft at the Indiana works is 200 ft. deep and has a concrete lining built around a framework of structural steel from top to bottom.

The Indiana company has 1500 acres of coal land surrounding the shaft and controls 5000 additional acres. The output of the mine will be 2000 tons a day. It is expected that everything will be ready to commence operation by Jan. 20.

NEW INCORPORATIONS

Henryetta, Okla.—The Deep Fork Coal Co.; capital stock, $10,000.

Great Falls, Mont.—The Tiger Butte Coal Co.; capital stock, $50,000.

Bonanza, Ark.—The Woodson Strickland Coal Co.; capital stock, $5000; to deal in coal.

Mount Vernon, Ill.—The King City Coal & Mining Co.; capital stock, $35,000; general mining business.

Charleston, W. Va.—The Hughes Creek Coal Co.; to increase its capital stock from $75,000 to $125,000.

Montgomery, Ala.—The Red Eagle Coal Co.; capital stock, $50,000. Home offices at Blockton, Bibb County.

Dawson, N. M.—The Vermeo Coal & Coke Co.; to change its name to the Dawson Fuel Sales Co.

Williamsburg, Ky.—The Mammoth Blue Gem Coal Co.; to increase its capital stock from $10,000 to $25,000.

Dover, Del.—The Electric Coal Co.; capital stock, $100,000; to buy, sell and deal in coal and all like products.

Toledo, Ohio—The France Coal Co.; capital stock, $10,000; to mine and deal in coal and other mineral products.

Buckhannon, W. Va.—The Welsh Colony R.R. Co.; capital stock, $5000; to own, improve and operate a railroad.

Charleston, W. Va.—The Cheat River Hydro-Electric Co. has changed its name to the Great River Hydro-Electric Co.

Wheeling, W. Va.—The California Erie Co.; capital stock, $5000; to acquire mines and mining rights, develop lands, etc.

St. Louis, Mo.—The Briquette Coal Mfg. Co.; capital stock, $100,000; to manufacture briquettes, to own and operate coal mines.

Connellsville, Penn.—The West Penn & Shenango Coal Co.; capital stock, $1,000,000; to develop western Pennsylvania tracts.

Albia, Iowa—The Monarch Coal Mining Co.; capital stock, $100,000. Incorporators, J. W. Gilschrist, B. A. Harris, H. A. Harris.

Toledo, Ohio—The France Coal Co.; $10,000. Charles L. France, H. E. Fayne, Lee J. Bronneman, G. H. France, Walter H. Jeffery.

Altoona, Penn.—Application will be made Jan. 28, 1913, by Anthony W. Smith, Alfred C. Steward and Luther E. Lewis, Richland Coal & Mining Co.

Connellsville, Penn.—Application will be made, Jan. 24, for a charter for the Connellsville Coal Co.; to mine coal, manufacture coke and sell both.

Columbus, Ohio—The Taylor-Williams Coal Co.; capital stock, $25,000. Incorporators, . W. Moore, S. E. Ranney, J. M. Taylor, E. E. Learned, W. B. Runyan.

New York, N. Y.—Buffalo Creek Coal & Brick Co.; capital stock, $250,000. Incorporators: C. A. Smith, R. D. McDonald, Pittsburgh, Penn.; C. E. Meyer, Ingram, Penn.

Connellsville, Penn.—The Consolidated Coal Co., of Baltimore, the Somerset Coal Co. and the Fairmont Coal Co. consolidate; capital stock, $31,750,000. Combined output, 10,000,000 tons a year.

Viola, Ill.—The McCraney Coal Mining Co.; to change its name to the McCraney Sand & Gravel Co., and to increase its capital stock from $10,000 to $25,000; principal office changed from Viola to Milan.

Roanoke, Va.—Hazard Coal Land Co.; capital stock, $100,000; minimum, $10,000. W. L. Brown, president, Bristol; J. B. Fishburn, vice-president, Roanoke; D. D. Hill, Jr., secretary and treasurer, Roanoke, Va.

Belington, W. Va.—The National Consolidated Coal Co.; capital stock, $2,000,000; to operate several new mines in West Virginia. A plan has also been announced to consolidate the leading southern coal companies under the name of the Consolidated Coal Co.; capital stock, $12,000,000.

Johnson City, Tenn.—A company, to be known as the Carter Coal Corporation, with a capital stock of $10,000,000, and with general offices at Johnson City, Tenn., has been organized by George L. Carter, of that place, for the purpose of developing his extensive coal holdings in Tennessee, Kentucky, Virginia and West Virginia. Mr. Carter is president of the company, J. C. Stone is vice-president, and T. F. Davis, secretary and treasurer. Most of the properties to be developed are along the Carolina, Clinchfield & Ohio and its proposed extensions to Elkhorn, Ky. The company proposes the immediate opening of mines in nine counties, with the most modern equipment. The aim of the promoters is to produce coal for the Panama Canal trade.

INDUSTRIAL NEWS

Brownsville, Tenn.—F. S. Chalfant and F. P. Stewart have bought 475 acres of coal in Luzerne Township at $55 an acre. Works will be built to employ 300 men.

Connellsville, Penn.—The Enterprise Realty Co. has sold 604 acres of coal land in Deep Valley, Springhill Township, to Fayette County parties at $100 an acre.

Frankfort, Ky.—According to the report of State Geologist J. B. Hoenig, a practically virgin coal field of fine proportions is on the eve of development along the upper Licking River.

Springfield, Ill.—The proposed merger of the coal interests of the Springfield district has been dropped for the present. Prices are considered too high for the earning powers of the plants.

Connellsville, Penn.—The outflow of Connellsville coke has awakened the upper Connellsville region into unwonted ac-

tivity. The region, in its complete collective sense, is now running full blast.

Washington, Penn.—A deal for the sale of 2500 acres of coal has just been negotiated by a syndicate of Pittsburgh men, for immediate development. The consideration exceeds one-half million dollars.

Massillon, Ohio—Valley Camp Coal Co. has purchased from the Akron Coal Co. the Columbia mine at this place. The mine will be operated as heretofore, but will be known as Valley Camp Coal Co., Columbia mine.

McDonald, Penn.—McDonald Coal Co. has bought a farm of 100 acres near Thomas Station on the Baltimore & Ohio R.R., which is underlaid with a 6-ft. bed of Pittsburgh coal. It is likely that mining operations will be begun in the spring.

Uniontown, Penn.—It is reported that J. O. Clark sold 400 acres of coal land in Braxton County, W. Va., Jan. 2, to Edward Prickell, of Pittsburgh. The consideration was $40 an acre. Clark purchased the acreage 6 years ago for $10 an acre.

Altoona, Penn.—The Bland-Cambria Coal Co., a newly organized concern, has taken over the Black coal field at Dougherty's Mines, at the terminal of the Altoona-Northern R.R., for the purpose of developing it. William H. Byers, of New York, is at the head.

Elkins, W. Va.—The Elkins mines are running as full as the scarcity of cars and men will permit. It has been officially stated that 200 men could be used up the creek, and that, while the car shortage is not so serious as during the past few weeks there is still a scarcity.

Ogden, Utah—The Lion Coal Co. has completed the connecting line between its mines and the Union Pacific R.R. The mines are located within 4 miles of Rock Springs, Wyo., and are said to embrace 600 acres of the best coal land in the district. The company has begun to ship its product.

Springfield, Ill.—It is stated that the New York Central road has purchased a tract of 30,000 acres of coal land in Montgomery County. This land will not be developed at once, but will be held in reserve for future locomotive necessities. The land is located along the line of the Big Four.

Connellsville, Penn.—L. F. Ruth is recently reported to have closed a deal for 800 acres of Greene County Coal land, which gives him nearly 2000 acres of coking coal along Dunkard Creek. The tendency toward developing Greene County coking coal is becoming more and more pronounced.

Harlan, Ky.—The Harlan Coal Mining Co. is reported to have sold to the Clover Fork Coal Co. a tract of 500 acres of land immediately adjoining the latter's tract at Kitt's. The entire consideration is said to be between $40,000 and $50,000, and to represent a good advance in the value of the land.

Wheeling, W. Va.—The miners at the Virginia Hill mine, at Lafferty, resumed work, Jan. 6, after an idleness of two weeks. It is stated that the operators notified the men that they would have to return to work or vacate the company houses. Upon the advice of their officials they returned to work.

Edmonton, Alta.—Official announcement has been made that Dr. R. Hoppe, of San Francisco, has acquired 28,160 acres of coal land in western Alberta, between Grand Prairie and the main line of the Grand Trunk Pacific R.R. Steps will be taken shortly to open the property for commercial purposes.

Fairmont, W. Va.—It is understood that a coal deal between M. A. Jolliffe and the Little Kanawha Syndicate was completed Jan. 4. As a result the holdings, recently secured by Mr. Joliffe, underlying some 1300 acres of land near Downs Station, have been transferred to the syndicate. It is understood also that the sum involved was close to $125,000.

Sharon, Penn.—The first consignment of coke arrived at the Fannie Furnace, Dec. 27, and the plant will be ready to resume operations in a short time. Officials stated that the furnace was to have been blown in Jan. 4. All the machinery has been overhauled and the plant is in first-class condition. of the Steel Corporation.

Fernie, B. C.—A snowslide has placed a damper upon operations in the Fernie, B. C., coal district. Such an occurrence is very unusual, the weather ordinarily being cold enough to prevent such a catastrophe. However, six lives were lost and seven others were fatally injured while working in the Coal Creek mines of the Crows Nest Coal Co.

Uniontown, Penn.—The Whyel Coal Co., which operates in the Yukon district, Westmoreland County, has added over 100 acres to its holdings. The latest purchase includes 3 tracts and involves a sum of $35,000.

The mines in the Sewickley field are running full time and the extensive development has given the section the title of the "million-dollar coalfield."

Martins Ferry, Ohio—Deputy Mine Inspector L. D. Devore has closed the Rush Run mine No. 3, of the Glenn's Run Mining Co., at Rush Run. Mr. Devore says he has discovered that the mining law was being violated in a number of places. The mine will remain closed until the company has complied with the law in regard to timbering and refuge holes on the main passageway.

Buffalo, N. Y.—The Sterling Coal Co., of Toronto, Ont., has bought out the Conger Coal Co., of that city, and will reorganize under the name of the Conger-Lehigh Coal Co., with R. E. Gibson, of the Conger company, president, and A. R. Gibson, acting manager. The agency of the Lehigh Valley Coal Co. will be continued and a large amount of bituminous will also be handled as before.

St. Louis, Mo.—The Santa Fé R.R. has purchased extensive coal-mining properties at Lehigh, Okla., from the Missouri Pacific R.R. Co. The property consists of more than 10,000 acres of the most productive coal land in Oklahoma. Mines now being worked are producing over 2000 tons a day. The Santa Fé management intends to open two additional shafts and increase the output to about 4000 tons a day.

Clarksburg, W. Va.—It is understood that the Righter Coal Co. has bought 136 acres of Pittsburgh coal and 86 acres of Red Stone coal along the West Virginia & Pittsburgh division of the Baltimore & Ohio R.R., 1½ miles south of Lost Creek. Grading for the sidetrack and switch is about completed, and the company: expects to be shipping coal within a short time. The property will be operated on the royalty plan.

Charleston, W. Va.—The Kanawha Coal Operators' Association has addressed a letter to the Interstate Commerce Commission complaining about the treatment accorded the Kanawha coal operators by the New York Central, the Chesapeake & Ohio and the Hocking Valley Rys. It is complained that the independent operators along the Kanawha & Michigan cannot fill half their orders because they are not given cars.

Missoula, Mont.—Butler Creek Coal Co., of Missoula, Mont., has discovered a large deposit of lignite coal on their property. County Clerk F. W. Kuphal, head of the company, states that the find was made after a tunnel of 30 ft. had been dug, and the discovery leads the stockholders of the company to believe there is coal on every acre of the 1920 which they hold under lease. They expect to have the product on the market before spring.

Weleetka, Okla.—The Monitor Oil Co. is reported to have struck a 4-ft. seam of fine coal while drilling for oil at a point 3 miles northeast of here. The coal was struck at a depth of 419 ft. and is of superior quality, with a good roof and no water to contend with.

Probabilities are that arrangements will be made to mine it at once. The new find was made on the Lake Moore property, close to the railroad track.

Grand Forks, N. D.—A big effort is being made to put lignite coal on the market in such a form that it will be convenient for handling. The Northern Briquetting Co., of Minot, will at once erect a large factory for pressing lignite coal into small briquettes.

Heretofore companies have been organized with too little capital, but it is expected that the new company will be able to make an exhaustive test of the marketable qualities of the coal.

Cape Breton, N. S.—The Dominion Coal Co. has commenced to pump out the workings of the Old Victoria mine, which was closed down in 1897. The colliery produced 100,000 tons in that year, and it is expected to obtain an output as soon as the workings are unwatered. The unworked area of this colliery is chiefly submarine. The coal seam is 7 ft. thick, inclined at an angle varying from 20 to 30 degrees.

The same company also intends to open up the Emery seam at their No. 3 Colliery. The upper seam is exhausted, and the existing plant will be utilized to mine the lower seam, which is between 4½ ft. and 5 ft. in thickness. The long-wall method will be used.

Wheeling, W. Va.—It has recently become known that the Number Eight Coal Co. has purchased the old Wabash Coal Co.'s mine, north of Dillonvale. The mine has changed hands 3 or 4 times during the past 5 or 6 years, and it is stated that it has never been profitably operated. The deal includes several hundred acres of good coal, miners' homes and other physical property. The price paid has not been made public.

For several years past the Number Eight Coal Co. has been buying up coal properties in eastern Ohio. During the past year it has acquired a number of good mines and valuable coal lands in Belmont County.

COAL TRADE REVIEWS

GENERAL REVIEW

The hard-coal situation is becoming steadily easier, due to the slightly better receipts and to a lessened demand from consumers. Because of the absence of more seasonable weather, all householders have saved from one to two tons so far this season, and the combined aggregate of these small lots makes an enormous tonnage.

The future of the anthracite trade holds out excellent possibilities; in fact, it never looked better. There is just a sufficient shortness in supply to stimulate the market to a normal, or possibly a little more than normal, activity. This also keeps the buyers a little anxious and on the lookout for tonnages, which is an essential feature of a good market.

Detention in the Eastern coastwise bituminous trade is less severe, and shippers are able to promise fairly prompt loading; as a consequence, there are more sales and for larger tonnages. The demand is somewhat stronger for spot shipments on the better grades, as a result of which quotations are up slightly; consumers of these are still being compelled to fill out their requirements with the off grades. The milder weather has also relieved the car situation, and there are few complaints about slow movement.

Nearly all the river mines in the Pittsburgh district have been closed by the high water, which has also interfered with railroad operations and caused a local shortage of equipment for loading. Minimum contract prices are being well maintained and quotations on slack are firmly established at a level well over contract figures. The holidays and floods have both interfered with production to such an extent that it is difficult to form a reliable opinion on the soft-coal situation, but it seems reasonable to believe that stocks are rather low and the market consequently on a firm basis.

In spite of the unfavorable weather conditions in Ohio the trade has been fairly strong and the movement good; the unseasonable weather has had a tendency to soften the domestic grades, but the steam sizes are in heavy demand, and the consumers are attempting to obtain surpluses. The same condition as regards domestic sizes applies also to the Southern markets, where some claims are being advanced that the winter is already over. The steam market, however, is strong in every department with the railroads taking their maximum tonnage on contracts and even confiscating consignments.

The Middlewestern market is uncertain and spotty. Some appearance of real winter weather had a tendency to tighten the situation up, but increased shipments has prevented a rise in prices. The best feature in the market is the steam grades, which are relatively firm and in big demand. A heavy snowstorm in the Rocky Mountain region, with accompanying landslides and delays in transportation, has created an active demand, but prices are unchanged.

BOSTON, MASS

Pocahontas and New River, for spot shipment, are up in price from a week ago; the demand is stronger in all directions, and loading conditions at Baltimore are rather worse than heretofore. There are also more sales and for larger tonnages, as a few of the agencies are working out of the vessel detention at Hampton Roads and are in position to promise fairly prompt loading. By far the most of the clearances are still on contract, however, and it will be a long time before all the shippers have caught up on season obligations. Prices for distribution inland are on about the level that ruled last month and there is only a scattering market at the higher quotations. The shortage of Georges Creek is the most notable feature of late and several of the large corporations that ordinarily depend on that source of supply are still being compelled to buy Pennsylvania grades to keep them going, supplemented by what spot shipments can be had from Hampton roads.

The market for ordinary grades at New York has sagged a little in response to the renewed offering of Pocahontas and New River, but there are only small quantities available and the speculative business is largely confined to shippers who have sizeable contracts on which coal can be used before charges accrue.

All-rail movement has been seriously affected, not only by an increasing shortage of cars but lately by floods in southern Pennsylvania and in West Virginia. Several important groups of operations have been put out of commission and that, together with the two or three days of cold weather served to give impetus to the demand for spot coal at the transfer points; $1.75@1.95 is the market for this delivery. There is more inquiry for transportation and several charters have been made at 80c., Norfolk to Boston.

Anthracite conditions here are somewhat easier. Dealers are in better shape in the larger cities, due partly to slightly better receipts but chiefly to a slackened demand from the consumer. The New York companies are sending a better volume of coal, but all the difficulties and restrictions as to sizes and kinds still prevail. Pea has joined stove as a size that is very hard to get. The call for premium anthracite fluctuates with the weather. With the absence of any prolonged cold this market would probably squeeze by without any great distress.

Current wholesale quotations are as follows:

Pocahontas, New River, f.o.b. Hampton Roads	$3.50@$3.60
Pocahontas, New River, on cars, Providence	4.50@ 4.75
Pocahontas, New River, on cars Boston	4.53@ 4.75
Clearfields, f.o.b. mine	1.65@ 1.90
Clearfields, en route, f.o.b. mine basis	1.75@ 2.00
Clearfields, f.o.b. Philadelphia	2.95@ 3.25
Clearfields, f.o.b. New York	3.25@ 3.50
Anthracite, delivered alongside Boston	7.25@ 7.40

NEW YORK

Bituminous—The soft-coal market is practically unchanged and still continues at the relatively high level of last week. There was a slight appearance of a tendency to ease off early in the week, but this was only temporary and was immediately succeeded by a resumption of the previous hard conditions. Now that the operations in the mining regions have once again got under way, after the holiday suspension, there appears to be a little more coal offering at the mines. This is not, however, having any effect on the local situation, as the demand remains strong, and there has been considerable pressure for coal at South Amboy.

As most of the fuel contracts expire Apr. 1, there is some activity in contracting at the present time. Operators are showing a determination to procure higher prices for the next year, and are holding firmly for advances of from 10c. to 25c. over the prevailing figures. In this connection it might be stated that the selling agencies are to be complimented in the fair and equitable manner by which they have dealt with their contract customers during the past year. In spite of the relative high price level prevailing through the last few months of the year, by which the companies might have added materially to their profits by disregarding their contract obligations and entering the spot market, they have in most instances adhered rigidly to these obligations.

Both the anthracite and bituminous prices continue firm at the following relatively high level:

	Anthracite		Bitiminous	
	Circular	Individual		
Broken*	$5.00	$5.00@5.10	West Virginia, steam	$3.25@3.35
Chestnut†	5.50	6.00@6.15	Fair grades, Penna.	3.25@3.35
Pea*	2.75	3.75@4.35	Good grade, Penna.	3.35@3.50
Buckwheat**	2.75	2.75@2.80	Best miller, Penna.	3.40@3.50
Buckwheat†	2.50	2.40@2.50	Georges Creek	3.50
Rice**	2.25	2.25@2.30		
Rice†	1.95	1.85@1.95		
Barley†	1.75	1.25@1.50		

* Scranton and Lehigh. ** Scranton. † Lehigh and Schuykill.

Anthracite—Mining operations in the anthracite fields were seriously curtailed over the holiday period, and since that time by celebrations among the foreign element, and can only now be said to have resumed in full blast. The effects of this, however, have not made any material change in the local situation, which still continues hard, and is the source of considerable anxiety, although not by any means as acute as was the case a month or two ago. In fact, the present anxiety is confined more to dealers who are loaded up with high-priced speculative coal, which they are now beginning to fear they will not be able to dispose of at a profitable figure.

Pea, stove and chestnut are in short supply and heavy demand, and are the leading features in the hard-coal market. Nut is still about normal, with egg quite plentiful and broken a trifle short. The weather still continues to be the

controlling feature in the market and pending no change in this respect a break in hard coal can hardly be looked for before March.

PHILADELPHIA, PENN.

The unusually open weather conditions that have prevailed in this vicinity, with only an occasional touch of real winter, has done more to relieve the situation as far as supplies of coal are concerned, than any other factor. It is safe to say that anywhere from one to two tons of coal have been saved each householder, and this explains why, notwithstanding the unusual demand for coal, everyone seems to be able to get a supply within a fairly reasonable time.

It has been the case, generally, all through the season that when it was absolutely necessary to have fuel, orders were filled, not promptly by any means, but without any unusual delay, except for certain sizes; the supplies received by the dealers have just enabled them to cover to this demand. A heavy snow storm or the cessation of traffic on any of the railroads centering in this city, would have soon shown to what extent this locality was in danger of discomfort or possibly a famine, as regards supplies.

There has been but one fall of snow thus far, which interfered little with deliveries, but a heavy storm, coupled with any freezing weather, is likely to bring about the condition, which the dealers have been anticipating the entire season. Supplies of stove, chestnut and pea, do not seem to be improving. Local offices of the large operators, and the individuals as well, are still besiged by the dealers, urging completion or partial fulfillment of their orders The future of the anthracite business has never looked so bright at the beginning of a new year as it does at the present time, and the dealers would consider conditions perfect, if they could only keep up to within a reasonable distance of their orders. Egg is getting to an easy stage, and is now used as a substitute for the other sizes. Shipments of the latter are contingent upon orders for the former, and even the first intimations of cutting prices on this size have been heard. One large individual operator, who ships largely to this market, indicated that their orders for egg coal were all completed, and this spells concessions, if the current production cannot be handled.

PITTSBURGH, PENN.

Bituminous—Production of coal continues to be interfered with. High water last week closed nearly all the river mines, and these are not yet again running. It also interfered with railroad operations and produced a fresh car shortage. While the weather has not been conducive to a heavy demand for domestic coal, production on the whole has been more interfered with, resulting in prices for prompt coal being established at a level measurably above the minimum contract prices. Slack has commanded a slight premium for some time, and in the past few days this has been quite heavy, small lots for spot shipment bringing $1.50, or 60c. above the contract price. Mine-run and screened coal are regularly quotable at 20c. to 30c. above circular prices, making mine-run $1.50@1.60. The anomaly of slack bringing as much as mine-run in some instances is explained by the fact of stoker-using consumers being caught short and requiring the slack. The regular minimum contract prices are being well maintained, and on contracts for six months' premium of 5c. to 10c. have been obtained in several instances in the past week. The regular minimum contract prices remain as follows: Slack, 90c.; nut, $1.05; nut and slack, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55 per ton at mine, Pittsburgh district.

The undertone of the market is strong and operators express more confidence in the future, from the standpoint of financial results, than they have for two years or more. Demand is expected to be good throughout the year, and a heavy demand in the lake trade is regarded as assured.

Connellsville Coke—The coke market is rather dull and lifeless, and in sharp contrast with some of the predictions which were made of a special shortage. At various times since the beginning of the holidays $4 has been shaded on prompt furnace coke, the market occasionally dropping to $3.80 for a day or two. In the past few days there has been a slight stiffening, and $4 is regarded as the minimum, but there is little demand at this figure. Demand has also been light as to contract furnace coke, some furnaces which were inquiring having apparently lost interest. In the case of idle merchant furnaces, the definite statement is now made that nothing will be done unless coke can be had at lower figures, or pig iron advances. Genuine foundry coke continues scarce. Much furnace coke is being shipped on contract, and there is little, if any, really standard foundry coke available for prompt shipment. There may be 72-hour coke available, but it is likely to run high in sulphur, and as to shipment in box cars this condition is extremely difficult to meet. We quote: Prompt furnace, $4; contract furnace (nominal), first half, $3.25@3.50; year, $3@3.25; prompt foundry, $4.25@4.50; contract foundry, $3.25@3.75.

BALTIMORE, MD.

Toward the latter part of the week, the market eased off slightly due to the exceptionally unseasonable weather conditions which have prevailed. Prices, however, did not undergo much change because of the fact that there was a shortage of the coal, due to the fact that hundreds of miners did not resume work during the previous week.

One of the features of the week was the spot-line business, the demand being much greater than at tide, with slightly better prices. At the beginning of the week the $2 quotation for the low grades was well maintained, but toward the close consumers purchased in any quantity at prices ranging from $1.80 to $1.90.

The weather which has prevailed in Baltimore all through the second week of the new year, was more like summer than winter. Such conditions, however, were conducive to favorable train movements, and there was no complaint at all about slow deliveries. The car situation is far better than some weeks ago, and many of the roads are ordering additional equipment to take care of increasing business. The Baltimore & Ohio is now negotiating for 1000 additional cars.

It is stated that there was a marked falling off in the demand for anthracite, but dealers say that a cold spell will revive their business.

BUFFALO, N. Y.

The bituminous market is active and all members of the trade look for an advance in prices soon, unless the production can be increased materially. It is hard to say at present just how production and consumption will line up eventually as conditions have been so abnormal lately. The holidays cut down both, and then mining was brought to a standstill by the floods. The car shortage is still present and promises to continue, in spite of the fact that it has let up in most other branches.

Some of the jobbers are already asking an advance of 10c. to new customers and this will be general soon if present conditions hold. There is no surplus coal anywhere. In fact, the stringency in bituminous is now greater than it is in anthracite, some sections being at times in fear of an actual famine.

The lack of motive power is accountable for the shortage as much as anything. Some of the towns across the Niagara in Canada are blocked; the Toronto, Hamilton & Buffalo R.R. has for several days refused to take at Welland any coal, except fuel, for the Canadian Pacific, and other roads have since followed. Again the roads themselves have no fuel supply ahead and shippers never know where their consignments will go.

There is a heavy call this way for low-volatile coal for office-building fuel and this is made all the more active by the anti-smoke agitation, which is doing what it can to shut off coal smoke. Mayor Fuhrman, of Buffalo, in a message to the city council recommended that all the railroads entering the city be forced to electrify their passenger terminals. It would be hard, though, to cut off this class of smoke without making the abolition general.

The promise of winter weather lately added firmness to all coal prices, but that has now passed off and the rainy conditions have returned. For about the first time the coal trade is fairly welcoming mild weather. This was true of the anthracite trade only, but it is now extending to bituminous also, on account of the slow running of the railroads.

Bituminous quotations for the week were $3 for Pittsburgh lump, $2.85 for three-quarter, $2.75 for mine-run and $2.50 for slack with a strong upward tendency. Allegheny Valley prices continue about 25c. lower than Pittsburgh. Coke is active and fairly strong at $6.25 for best Connellsville foundry.

The demand for anthracite is strong, with only egg at all easy. The price of independent, for the stove sizes is from $1 to $1.25 over circular, which is the best gage of that market at present.

COLUMBUS, OHIO

There are reports of some of the larger steam users attempting to accumulate a surplus to guard against an emergency, especially an acute car shortage or congestion. But their efforts have not been very strong and surpluses are the exception instead of the rule. Dealers stocks are said to be rather light for the season of the year and lower temperatures are expected to bring about a rush of orders for immediate shipment. The Chicago market is fairly strong

which aids in maintaining quotations in the Buckeye state.

The steam trade is by far the strongest point in the market. The requirements of the larger manufacturing plants are heavy and railroads are also taking a larger tonnage to move a good freight business. There is no indication of a let-up in industrial activity and as a result steam contracts are good; renewal of contracts, which expire at this time, are being made on a slightly higher basis as a rule. At least the reign of exceedingly cheap fuel contracts on the part of the railroads is a thing of the past.

One of the best features of the trade is the good demand for the small sizes. Nut, pea and slack and coarse slack are all strong in every mining district of the state and spot orders are taken at a high figure. The supply of that sort of coal appears to be limited.

Retailers are having some difficulty in making deliveries because of the slippery condition of the streets. Retail prices are firm at the levels which have prevailed for some time.

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$2.00	.....	$2.25	$2.00
¾-inch	1.80	$1.70	2.00	1.70
Nut	1.50	.....	2.00	.....
Nut, pea and slack	1.20	.....	1.25	1.20
Mine-run	1.40	1.25	1.35	1.40
Coarse slack	1.00	1.15	1.10	1.00

CLEVELAND, OHIO

With the comparatively mild weather prevailing, no particular change in the market has resulted. Producers report a slight curtailment in domestic shipments, but this condition will have little effect on the market.

Present wholesale quotations are as follows per short ton f.o.b. mines:

District	Freight Rate	¾-in.	Mine Run	Slack
Youghiogheny	$1.00	$1.35	$1.25	$1.10
Pittsburgh No. 8	0.90	1.20	1.10	1.20
Goshen No. 6	0.70	1.45	1.35	1.20
Coshocton	0.70	1.75	1.50	1.30

Pocahontas coal is quite scarce. Lump and egg is quoted at $2.50; run-of-mine, $1.35, and slack, 90c. f.o.b. mines; $2.50 is quoted on Massillon 1¼-in. lump at the mines. Foundry coke is selling at $4.50 and furnace at $4 f.o.b. ovens.

While the car supply has been less stringent since the holidays, railroads continue to use every possible means to expedite the movement of their equipment. They are also impressing upon shippers the necessity of loading all cars to the fullest possible extent.

The pressing demand for steam coal coupled with the curtailed production due to high water in the vicinity of Pittsburgh and Wheeling will undoubtedly keep the market firm for some time.

BIRMINGHAM, ALA.

The temperature has been high for this season of the year, and some claim that the winter is already over and that spring will be with us within six weeks. Although prices are still firm, both the domestic and steam situation is just a bit easier. To many of the mines this situation is a great relief. There is ample business for all as the railroads are taking maximum tonnages on contracts placed in this district, and in some instances they were compelled to confiscate coal just after the holidays. This was especially true of railroad lines not touching the coal fields.

The coke market remains strong in all its departments. The iron melt in the South is breaking all previous high records and this has reflected directly in the foundry coke trade.

LOUISVILLE, KY.

There has been a substantial slump in the local market—not so much in prices, although they have naturally fallen off, as in demand. Many operators, in consequence, are simply not offering coal, rather than be compelled to take summer prices or thereabouts for their product.

This situation is largely due to the fact that the holiday lay-off permitted the accumulation of a large supply of cars. Even the largest operators have, therefore, been able to load out their entire capacity for the past week or ten days, with the result that buyers have all the coal they want, and are largely out of the market. The average industrial concern has no storage capacity to speak of, and consequently gets along on a more or less hand-to-mouth basis, taking only enough coal to answer its immediate requirements when there is a plentiful supply, and staggering along on the verge of famine when there is any shortage whatever.

Owing to the conditions noted, prices are extremely uncertain, and cover a wide range between one sale and another. Block is selling f.o.b. mines in eastern Kentucky at $2@2.25, and it is hard to say just what other domestic grades should bring at this time. Mine-run ranges between $1.10@1.25, and nut and slack has been sold as low as 60c., and on up to 80@85c. Western Kentucky prices on the steam grades are ruling as high or higher than those in eastern Kentucky, which is unusual. There is an abundance of river coal available, as has been the case all winter.

MEMPHIS, TENN.

The conditions here have changed little during the past three to four weeks, and there is a light demand on all grades of coal throughout the entire section. While there is no surplus to speak of, the prices have gradually gone lower from time to time, and now that the car situation is improving, it looks as though there will be a weak market for the balance of the season, unless weather conditions make the demand heavier and shipping conditions worse. Prices on west Kentucky coal are practically unchanged. East Tennessee-Kentucky coals have held fairly well, inasmuch as there were light stocks of this grade throughout the territory. These are now selling in the Jellico district at $2.50@2.75; Straight Creek and Holland Field, $2@2.25; Illinois 6-in. lump and egg, $1.40 per ton f.o.b. mines.

INDIANAPOLIS, IND.

Conditions have changed little within the week. Although the weather man has been predicting cold waves, none have arrived, but one is again said to be immediately ahead of us. Prices hold steady at the recent slight declines. The weather is giving retail dealers a chance to stock up as consumption has been light under moderate temperature. The car situation is, on the whole, satisfactory, and operators are not complaining. While the domestic consumption has been below the average at this season, the demand for steam grades is good. The movement of coal from the East shows some falling off. Mines are not working full time, but are averaging well.

The following represents closely the Indiana mine prices, Indianapolis prices being 50c. higher, to cover freight:

No. 4 mine-run	$1.10	Domestic lump 5- and 6-in.	$1.65
Nos. 5 and 6 mine-run	1.00	Screenings, No. 4	0.70
No. 4 steam lump, 1½-in.	1.25	Screenings No. 5 and 6	0.60
Nut, No. 4	1.30	Washed coal, Nos. 1 & 2	$1.75@2.00
Egg	1.40	Brazil block	2.20
Domestic lump 2½-in.	1.50		

DETROIT, MICH.

Bituminous—A few weeks of most discouraging weather created a congestion of both steam and domestic fuel, and caused a decided weakness in the coal market but operators are now highly elated because of the change.

There has been no improvement in the domestic trade for the past week which is attributed to the mild weather; dealers seem to be stocked to their utmost. The steam trade seems to be a little stronger and some of the large manufacturers are making inquiries as to closing of contracts.

The prevailing prices for today are as follows:

	W.Va. Splint	Gas	Hocking	Pitts. No. 8	Jackson Hill	Pocahontas
Domestic lump	$1.60	.....	$1.70	.....	$2.40	$2.50
Egg	1.60	.....	.....	.....	2.40	2.50
Nut	1.40	.....	1.60	.....	.....	.....
¾-lump	1.30	$1.30	.....	$1.30	.....	.....
Mine-run	1.15	1.15	1.20	1.20	.....	1.40
Slack	1.10	1.00	1.00	1.00	.....	1.15

CHICAGO

Anthracite coal is strong, with some premium prices being paid where dealers are running short and must have coal. All grades of steam coal, with the exception of screenings, are firm. The price of fine coal has been boosted about 10c. a ton. A drop of about 25c. a ton has been noted in prices for coke.

Prices for Hocking coal cover a wide range. Some is selling on track at $1.50, and $1.75 is being obtained for consignments in transit. There is a strong spot market for smokeless, prices ranging from $1.50 to $1.75 for mine-run. Lump and egg is quoted at from $2 to $2.25 at the mines. There are a variety of prices for splint coal. The better prepared grade is sold for delivery in the country in box cars at prices ranging from $2.10 to $2.20 at the mines. Other coal in open cars is being sold in transit at $1.75.

Prevailing prices at Chicago are:

	Sullivan Co.	Springfield	Clinton	W. Va.
4-in. lump	$2.62	.....	.....	.....
Domestic lump	.....	$2.32	$2.27	.....
Egg	2.52	.....	.....	$4.05 @ 4.30
Steam lump	2.07 @ 2.17	2.12	2.17	.....
Mine-run	.....	1.97	1.97	3.55 @ 3.80
Screenings	1.72 @ 1.77	1.57 @ 1.62	1.57 @ 1.62	.....

Prices asked for coke are: Connellsville and Wise County, $6.50@6.75; byproduct, egg, stove and nut, $5.75@6; gas house $6.

MINNEAPOLIS—ST. PAUL

During the past week the weather has been a great deal more favorable to the coal trade than at any time previous this season. However, conditions have not changed materially, and coal in nearly all grades is to be had in plenty and can be bought at a low price, considering the period of the year. Another week or two of this cold weather is what dealers are hoping for, and if it does come, conditions will be greatly changed.

Prices are uncertain and spotty on nearly all grades. Illinois screenings are selling at fairly good prices, in fact, much stronger than during the previous five or six weeks. The demand for Illinois steam lump and mine-run has been steady, with prices firm. While some of the larger Franklin County operators have been trying to hold at $2 for lump and egg, they have been practically forced by the smaller mines to sell for $1.75, and in some cases for $1.50.

Demurrage coal is reported at nearly every terminal between here and the mines and lower prices than the above have been made to move same. Reports from Illinois mines bear out the fact that the car supply is much better than heretofore.

ST. LOUIS, MO.

St. Louis experienced a sleet storm during the past week; the rain, which started in Sunday morning, turned to sleet Sunday night, and continued for a day or so. However, this did not have a tendency to advance prices on Carterville coal any, although Standard went somewhat higher Monday. On Tuesday prices on all grades went up, and continued that way throughout the week, until Saturday, when there was considerable Carterville offered at lower prices than it had been selling for all week. This was due to the operators and shippers wanting to clean up over Sunday.

However, during the week prices were made for only a day at a time, the operators and jobbers hoping that each day would see an advance, but there was no material change after Tuesday. Prices to the country trade were made for wire acceptance only.

The prevailing prices are:

	Carterville and Franklin Co.	Trenton and Big Muddy	Mt. Olive	Standard
2-in. lump	.....	.....	.....	$1.05 @ 1.15
3-in. lump	.....	.....	$1.40	.....
6-in. lump	$1.40 @ 1.50	.....	1.60	1.25 @ 1.35
Lump and egg	1.45 @ 1.60	$2.25	.....	.....
No. 1 nut	1.30 @ 1.40	.....	.....	.....
Screenings	0.75 @ 0.85	.....	.....	0.60 @ 0.65
Mine-run	1.10 @ 1.20	.....	.....	0.90 @ 1.00
No. 1 washed nut	1.50 @ 1.60	.....	.....	.....
No. 2 washed nut	1.35 @ 1.40	.....	.....	.....
No. 3 washed nut	1.35 @ 1.40	.....	.....	.....
No. 4 washed nut	1.30 @ 1.35	.....	.....	.....
No. 5 washed nut	0.85 @ 0.90	.....	.....	.....

OGDEN, UTAH

During the past week there has been a decided change, and winter weather is prevailing over the entire intermountain territory. The general storm made itself felt in the Northwest about Jan. 3, with a rapid drop in temperature. Seattle, Tacoma, Spokane and surrounding country experienced some real winter weather. The storm followed a southeasterly direction and California experienced the lowest temperature in years, with ice and snow at Sacramento, San Francisco and inland points.

The storm found the dealers well stocked with coal which was quickly delivered to the consumer and as the railroads have been furnishing a good supply of cars, there was a large tonnage of coal in transit. No reports of a coal shortage have been received, but judging from the way orders are being placed the supply at the various points is rapidly being exhausted and should the low temperature continue there will be a shortage of coal.

Both Wyoming and Utah quotations remain unchanged, as follows: Lump, $2.75; nut, $2.25; mine-run, $1.85, and Utah slack at $1.25 with Wyoming 25c. lower.

PORTLAND, ORE.

Portland and the Pacific Northwest had its first real cold spell this winter, but it was of rather short duration, the weather moderating in four days. However, it had the effect of increasing the demand for fuel for domestic purposes and coal dealers here were preparing to add on $1 per ton in case of an avalanche of orders. But for the moderation in the weather the rush no doubt would have followed.

From Ellensburg, Wash., comes the report that, owing to a snow blockade on the Roslyn-Cle-Elum branch of the Northern Pacific, urgent calls for coal are pouring into the mines of that section. As a result of the temporary tie-up of this line there is a shortage in many quarters, on Roslyn coal.

PRODUCTION AND TRANSPORTATION STATISTICS

ANTHRACITE SHIPMENTS

The following is a comparative state of anthracite shipments for December, 1911-12, and the totals for the year, in long tons:

	December		Year	
	1912	1911	1912	1911
Phila. & Reading	1,223,880	1,238,727	12,852,386	13,265,758
Lehigh Valley	1,108,765	1,109,705	11,791,601	12,603,000
Cent. R. R. N. J.	760,479	820,963	8,342,447	9,218,802
Del. Lack. & West	850,977	827,248	9,065,622	9,869,620
Del. & Hudson	598,969	592,922	6,361,238	7,206,731
Pennsylvania	543,361	600,803	7,435,697	8,800,179
Erie	667,532	722,093	7,435,697	8,800,179
Ont. & Western	190,539	202,966	2,213,382	2,495,476
Total	5,944,502	6,115,427	63,610,587	69,954,299

CONNELLSVILLE COKE

The "Courier" reports production and shipments in the Connellsville region for the week ended Jan. 11, as follows:

Production (tons)	Week	2 weeks	*Shipments (cars)*	Week	2 weeks
			Pittsburgh	4,189	8,437
Connellsville	223,834	436,446	W. of Pittsburgh	6,828	13,080
Lower Connellsv'le	185,630	357,222	E. of Region	917	1,814
Total	409,464	793,668	Total	11,934	23,331
Same period 1912	315,432	623,338		9,341	18,436

FOREIGN MARKETS

GREAT BRITAIN

Jan. 3—The tone of the market is very steady. Collieries appear to be heavily booked for January. Quotations are approximately as follows:

Best Welsh steam	$4.50	Best Monmouthshires	$4.20
Best seconds	4.26	Seconds	3.72
Seconds	4.20	Best Cardiff smalls	3.72
Best dry coals	4.38	Seconds	3.48

The prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days —less 2½ %.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Jan. 11.

Company	High	Low	Last
American Coal Products	90	90	90
American Coal Products Pref.	111	111	111
Colorado Fuel & Iron	36	33⅜	35
Consolidation Coal of Maryland	103⅜	103¼	103¼
Island Creek Coal Pref.	87¼	87¼	87¼
Lehigh Valley Coal Sales	240	204	204
Pittsburgh Coal	24¼	23⅜	23⅜
Pittsburgh Coal Pref.	95	93	93¾
Pond Creek	28	25⅜	26
Reading	168¾	165¼	167
Reading 1st Pref.	90	90	90
Reading 2nd Pref.	93	93	93
Virginia Iron, Coal & Coke	58	55	55

Bonds Company	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s f g 5s	97½	..	98	Dec. '12	97	100⅜
Colo. F. & I. gen. 6s	....	....	107½	June '12	107½	107½
Col. Ind. 1st & coll. 5s. gu	83½	Sale	83¾	83¼	72½	85½
Cons. Ind. Coal Me. 1s 5s	....	84½	85	June '11	....	....
Cons. Coal 1st and ref. 5s	....	94	93	Oct. '12	93	94
Gr. Riv. Coal & C. 1st g 6s	97	102	102¾	Apr. '06	....	....
K. & H. C. & C. 1st s f g 5s	....	....	98	Dec. '12	97¾	98¾
Pocah. Con. Coll. 1st s f 5s	87	88¾	87¾	Jan. '13	81½	89¾
St. L. Rky. Mt. & Pac. 1st 5s	78½	Sale	78½	79½	79½	84½
Tenn. Coal gen. 5s	102½	103¾	102¾	102¾	101½	103¾
Birm. Div. 1st consol. 6s	102½	103	102½	Dec. '12	102½	104½
Tenn. Div. 1st g 6s	101½	103¾	101¾	Dec. '12	101¾	104
Cah. C. M. Co. 1st g 6s	103½	....	110	Jan. '09	....	....
Utah Fuel 1st g 5s	....	....	....	.....	....	....
Victor Fuel 1st s f 5s	....	83	85½	Oct. '12	85½	86
Va. I. Coal & Coke 1st g 5s	96½	96¾	96½	97	94½	98½

Dominion Coal Co., Ltd.—Dividend No. 40 on preferred, of 3½ % payable Feb. 1 to holders of record Jan. 18.

INDEX OF COAL LITERATURE

The following is a list of abbreviations used below:
A.E.G.-Ztg. = A.E.G.-Zeitung.
Am. Lab. Legis. Rev. = American Labor Legislation Revue.
Ann. Mines = Annales des Mines.
Ann. Mines Belgique = Annales des Mines de Belgique.
Austral. Min. Stand. = Australian Mining Standard.
Berg-Huttenmänn. Rdsch. = Berg- und Huttenmännische Rundschau.
Bull. Am. Inst. Min. Eng. = Bulletin American Institute of Mining Engineers.
Can. Eng. = Canadian Engineer.
Can. Min. Jl. = Canadian Mining Journal.
Chem. Eng. = Chemical Engineer.
Coll. Guard. = Colliery Guardian.
Comp.-Air Mag. = Compressed Air Magazine.
Compt. Rendus Acad. Sc. = Comptes Rendus de l'Académie des Sciences.
El. Eng. = Electrical Engineering.
El. Jl. = Electrical Journal.
El. Kraftbetr. = Electrische Kraftbetriebe und Bahnen.
Eng. Contract. = Engineering Contractor.
Eng. Min. Jl. = Engineering and Mining Journal.
Eng. News = Engineering News.
Fördertechnik = Die Fördertechnik.
Geol. Mag. = Geological Magazine.
Handel und Ind. = Handel und Industrie.
Int. Mar. Eng. = International Marine Engineering.
Inst. Min. Metal = Institute of Mining and Metallurgy.
Iit. Volkswirt = Internationaler Volkswirt.
Iron Coal Trades Rev. = Iron and Coal Trades Review.
Jl. Soc. Chem. Ind. = Journal of the Society of Chemical Industry.
Jl. Ind. Engin. Chem. = Journal of Industrial and Engineering Chemistry.
Jl. Royal Soc. Arts = Journal of the Royal Society of Arts.
Jl. S. Afr. Inst. Eng. = Journal of the South African Institute of Engineers.
Kohle Erz = Kohle und Erz.
Lumière El. = Lumière Electrique.
Min. Eng. = Mining Engineer.
Mines Minerals = Mines and Minerals.
Min. Sc. Press = Mining and Scientific Press.
Min. World Eng. Rec. = Mining World and Engineering Record.
Mon. Ind. Gaz. = Moniteur de l'Industrie du Gaz et de l'Electricité.
Montan. Rdsch. = Montanistische Rundschau.
Oesterr. Z. Berg- Huttenwes. = Oesterreichische Zeitschrift für Berg und Hüttenwesen.
Portefeuille Econ. Machines = Portefeuille économique des machines.
Proc. Acad. Pol. Sc. N. Y. = Proceedings of Academy of Political Science, New York.
Proc. Am. Inst. El. Eng. = Proceedings of American Institute of Electrical Engineers.
Proc. S. Wales Inst. Eng. = Proceedings of South Wales Institute of Engineers.
Rev. Noire = Revue Noire.
Rev. Univ. Mines = Revue Universelle des Mines.
Saarbrucker Berg. Kal. = Saarbrucker Bergmanns Kalendar.
S. Afr. Min. Jl. = South African Mining Journal.
Soz.-Technik = Sozial-Technik.
Stahl Eisen = Stahl und Eisen.
Stein-Braunkohle = Stein und Braunkohle.
Tech. Rdsch. = Technische Rundschau.
Techn. Wirtsch. = Technik und Wirtschaft.
Tekn. Tidskrift = Teknisk Tidskrift.
Trans. Min. Inst. Scot. = Transactions of Mining Institute of Scotland.
Trans. Inst. Min. Eng. = Transactions of the Institute of Mining Engineers
Trans. Manchester Geol. Min. Soc. = Transactions of the Manchester Geological and Mining Society.
Ung. Mont. Ind. = Ungarische Montanindustrie und Handelszeitung.
Z. Dampfkessel-Betr. = Zeitschrift für Dampfkessel und Maschinenbetrieb.
Z. El. Mach. = Zeitschrift für Elektrotechnik und Maschinenbau.

Note: We shall be glad to obtain for readers, where possible, copies of the papers referred to.

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I—GENERAL

Efficiency Engineering Applied to Mining. G. A. Collins, "Am. Inst. Min. Eng." Bull. 69, p. 995-1008. 2 fig.

Coal Mining Statistics, Colonial and Foreign. "Coll. Guard." vol. 104. 2706. p. 938-9. 15c.

The Results of Upper Silesian Coal Mining, in 1911. (Die Ergebnisse des Oberschlesischen Steinkohlenbergbaues im Jahre 1911.) "Stein Braunkohle." 1912. 11. p. 131. 35c.

Austrian Mines. "Min. Jl." vol. 99. 4030. p. 1115-7. (Coal is 86.65 per cent. of the mineral output of the empire, iron is 7.79 per cent. and the remainder covers the production of lead, copper, zinc and silver and gold.) 25c.

Conditions of Labor in the Mines and Similar Industries in the Prussian Mining Districts. (Die Arbeitsverhaeltnisse auf den Bergwerks- und aehnlichen Betrieben in der preussischen Oberbergamtsbezirken.) "Bergbau." 1912. 20. p. 277-8. 50c.

Successes of the Trade Union Movement in Mining. (Erfolge der Gerwerkschaftsbewegung im Bergbau.) 8 vo. 44 p. Cologne 1912. Christl. Gewerkschaftsverlag. 50c.

The Shadow of a Great Strike: The Miners' Victory. Samuel Gompers. "Am. Federationist." vol. 19. 7. 1912. p. 517-29.

Consequences of the English Miners' Strike. Alms. (Die Folgen des deutschen und englishen Bergarbeiterstreiks.) "Bergbau." 1912. 25. p. 349-52. 50c.

The New Insurance Regulations for Mining Officials. (Die Neuregelung des Versicherungswesens fuer die Grubenbeamten.) "Bergbau." 1912. 39. p. 547-50; 40. p. 569-71. $7.

Workmen's Insurance and Hygienics. Hanauer. (Arbeiterversicherung und Gewerbehygiene.) "Bergbau." 1912. 15. p. 211. 50c.

List of Patents Granted by the German Patent Office in 1911. (Verzeichnis der v. dem kaiserl. Patentamt im J. 1911 erteilten Patente.) Published by the German Patent Office. 2 pts. 906 p. Berlin, Heymann, 1912. $12.

Mining Law Development. H. C. & L. H. Hoover. "Eng. Min. Jl." vol. 94. 18. p. 823-5. (The early growth of mining law gave individuals widening rights at the expense of the State; the tendency now is to restrict the individual for the good of the State.)

The New English Mining Law. H. A. Walter. (Das neue englische Grubengesetz.) "Bergbau." 1912. 14. p. 191-5 50c.

The Museum for Mining Technology at Berlin. Paul Martell. (Das Museum fuer Bergbau und Huettenwesen zu Berlin.) "Bergbau." 1912. 43. p. 601-2. 50c.

Remarks on a Few Objects Shown at the Mining Exhibition at Essen. Schultze. (Mitteilungen ueber einige auf der bergmaennischen Ausstellung zu Essen ausgestellte Gegenstaende.) "Bergbau." 1912. 27. p. 377-80; p. 390-2. 17. fig. $1.

II—GEOLOGY

The Southeastern Coalfield. The Associated Rocks and the Buried Plateau. "Coll. Guard." vol. 104. 2706. p. 940-1. 15c.

A New Stratum in the Gas-flaming Coal Section of the Ruhr Coal District. (Eine neue Schict in der Gasflammkohlen-Partie des Ruhrkohlen-Bezirkes.) "Tiefbohrwes." 1912. 12. p. 47. 50c.

Map of Workable Mineral Deposits. Everding, H. (Karte der nutzbaren Lagerstaetten Deutschlands.) H. Baumann & F. Schuenemann, 1911. Geolog. Landesanstalt, 1912. M3. (Group: Prussia and neighboring Federal States. Pt. 1 contains sheets: Cleeves, Wesel, Muenster (Westphalia) Erkelenz, Duesseldorf, Arnsberg, Aachen, Cologne, Siegen Malmedy, Cochem and Coblenz. Two tables, introduction, and explanatory note of coloring.)

Development of the Coal Measures in the West Galician Weichsel District of the Upper Silesian Coal Region. Michael, R. (Die Entwicklung der Steinkohlenformation im westgalizischen Weichselgebiet des oberschleischen Steinkohlenbezirkes.) "JB. d. kgl. preuss. geol. Landesanst." Lex. 8 vo. p. 159-306. 1 ill. Berlin, Geolog. Landesanstalt. 1912. $2.

III—MINING TECHNOLOGY

How Penn-Mary Coal Mine Doubled its Capacity. "Coal Age." vol. 2. p. 606-8. 7 fig. (Heat formerly wasted was utilized, excess direct electrical current converted into alternating for use in new portions of the mine.)

The Lathrop Coal Company. J. H. Williams. "Mines Min." vol. 33. 4. p. 179-81. 1 plan. 1 ill. (The new plant installation and methods of mining employed.)

Breyten Collieries, Transvaal. S. A. "S. Afric. Min. Jl." vol. 22. 1101. p. 263-5. 3 fig. (A description of mines and equipment with output of 55,000 tons per month.) 50c.

Underground Layout and Working Arrangements for a New Colliery. J. Turtington. "Min. Eng." vol. 16. 222. p. 225-9. 4 fig.

A Recent Swedish Compressed Air Plant. Hjalmar Erikson. (Eine neuzeitliche schwedische Druckluftanlage.) "Glueckauf" 1912. 34. p. 1368-72. 8 fig. (Description of plant for the production of compressed air, recently built by the Striber Co. for their mines.) 75c.

A Stonedust Distributing Machine. "Colliery Guard." vol. 104. 2710. p. 1139. 1 fig. (The apparatus employed in the Victor-American Fuel Co.'s collieries, Colorado, to cover the sides and roofs of haulage ways with stonedust and free them from coal dust.) 15c.

IV—WORKING OF MINERALS

Planning Our Workings in a Mine and Various Methods of Making Levels. Graf, E. (Einteilung des Grubenfeldes

in Baufelder und die verschiedene Art der Sohlenbildung.) "Stein. Braunkohle." 1912. 17. p. 200-1. 35c.

On the Workings of Vertical Seams. Scholtze, G. (Beitrag zum Abbau stehender Floeze.) "Kohle Erz." 1912. 32 p. 801-4. 50c.

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Facts about Anthracite Mining. E. W. Parker. "Mines Min." vol. 33. 4. p. 202-3. (The history of the industry and development of economy in production.)

Jasper Park Colliery at Pocahontas, Alberta. "Canad. Min. Jl." vol. 33. 21. p. 750-2. 3 fig. (Development operation with plant lay-out and construction.) 40c.

Improvements at the Old Silkstone Collieries. "Coal Merch." vol. 25. 634. p. 513-4. 2 fig. (A washery capable of dealing with 1200 tons of coal in ten hours: eighty Koppers latest type of regenerative ovens and recovery plant; the output will be 3500 tons of coke per week.) 15c.

V—BORING, SHAFT SINKING AND TUNNELING

New Patterns in Deep Boring Machines and Tools. (Neukonstruktionen in Tiefbohrmaschinen und Geraeten.) "Tiefbohrwes." 1912. 18. p. 73-80. 19. p. 85-7. 23 fig.

Water Flush Percussion Method of Shaft Boring. Krecke. (Spuelschalgverfahren zum Abbohren von Schaechten.) "Glueckauf," 1912. 36. p. 1471-3. 2 fig. (Supplement to previous paper by the same author on the Stockfish Method.) 75c.

Appliances Used for Determining the Deflection of Boreholes in Shaft Sinking. (Die beim Schachtbau verwendeten Apparate zur Messung von Bohrlochsabweichungen.) "Kohle Erz." 1912. 40. p. 993-1002. 5 fig.; 41. p. 1025-32. 3 fig. (Abstract of paper read by Maurice Bodart before the Association of Old Instruments at the Liege School of Engineering, on the methods used for measuring the deflection of boreholes in sinking shafts by the congelation process through quicksands in Belgium.) $1.

Shaft Sinking in Presence of Large Inflows of Salt Water. Groeting, Heinr. (Ein Beitrag zum Schactabteufen bei grossem Salzwasserzufluss.) "Bergbau." 1912. 42. p. 585-6. 3 fig. 50c.

Method of Thawing-out a Shaft Sunk by the Congelation Process. (Verfahren zum Auftauen eines unter Anwendung des Gefrierverfahrens ausgefuehrten Schachtes.) "Tiefbohrwes." 1912. 14. p. 95-6. 1 fig. 50c.

VI—BLASTING, EXPLOSIVES

Progress in Mine Blasting. (Fortschritte auf dem Gebiete der Minenzuendung.) "Kohle Erz." 1912. 42. p. 1089-92. 4 fig. 50c.

The Influence of Temperature and Pressure on the Combustion Speed of Fuses. Walter Snelling and Willard Cope. (Ueber den Einfluss der Temperatur und des Druckes auf die Verbrennungsgeschwindigkeit der Zuendschnur.) "Z. Schiess-Sprengstoffe." 1912. 14. p. 285-9. 15 p. 205-8. 18. p. 362-7.

Powder Which Is Soluble in Water. F. Rasching. (Wasserloesliches Schiesspulver.) "Bergbau," 1912. 29. p. 407-8. 50c.

Storage of Explosives at Mines. "Colliery Guard." vol. 104. 2707. p. 987-9. 2 tab. 15c.

Chemical Testing of Mining Explosives. J. Moir. "Chem. Tr. Jl." vol. 51. 1328. p. 457-8. 10c.

VII—TIMBERING, PACKING, ETC.

Method of Lining Shafts with Ferro-concrete Without False Work. (Verfahren zur Herstellung von Schachtauskleidungen aus Eisenbeton ohne Schalung.) "Tiefbohrwes." 1912. 17. p. 69. 3 fig. 50c.

The Preservation of Mine Timber. Max Landau. (Konservierung von Grubenhoelzern.) "Bergbau," 1912. 40. p. 563-4. 50c.

VIII—HOISTING AND HAULAGE

The Braking of High Speed Winding Engines. G. K. Chambers. "S. Afric. Min. Jl." vol. 22. 1099. p. 216. 50c.

Compressed Air Hoisting at Butte, Mont. T. T. Read. "Min. Sci. Press." vol. 105. 18. p. 554-6. 2 fig. (Hoisting shafts in a half-mile radius with central power plant and air storage system.)

Air-balanced Hoisting Engine. R. H. Carbett. "Min. Min." vol. 33. 4. p. 221-2. 2 fig. (The power developed by the descending skip compresses air to be used in hoisting.)

Winding Engine Control. "Canad. Min. Jl." vol. 33. 21. p. 734-42. 16 fig. (Apparatus controlling over-speeding and over-winding recently introduced.) 40c.

Electric Hoists at the Hecla Mine. E. M. Murphy. "Am. Inst. Ming. Eng." Bull. 69. p. 977-94. 14 fig.

Electric Hauling and Pumping in the Penn-Mary Colliery. "Coal Age." vol. 2. 19. p. 641-3. 11 fig. 1 tab.; 20. p. 674-6. 14 fig. (The steepness of the grade makes many hoists necessary; an electric larry with a reel mounted below the frame carries the rock to the end of a long dump.)

First Cost and Efficiency of Electric Main Hauling Machines. Karl Meller. (Anlagekosten und Wirkungsgrad bei elektrisch betriebenen Hauptschachtfoerder-maschinen, "Glueckauf." 1912. 42. p. 1719-21. 2 fig. 75c.

Experiments with Electrical and Steam Winding Engines. Robbert. (Untersuchungen an elektrische und mit Dampf betriebenen Foerdermaschinen.) "Z. Ver. D. Ing." 1912. 36. p. 1456-60. 5 fig. (Comparative trials of four steam and four electrical engines. Short description of plant and results. Fundamental principles affecting the consumption of energy. Results of individual trials with steam winding engines.) 50c.

Overwind Prevention in England. "Coal Age." vol. 2. 21. p. 710-11. 7 fig.

The Use of Old Wire Ropes in Timbering Roadways. J. McLuckie. "Trans. Min. Inst. Scot." vol. 35. 1. p. 37-40. $1.50.

New Cage Chains. Puetz, O. (Ein neues Soerderkorb-Zwischengeschirr.) "Glueckauf." 1912. 38. p. 1554-5. 2 fig. 75c.

Compressed Air Mine Locomotives. (Druckluft-Gruben-lokomotiven. "Z. Ver. D. Ing." 1912. 34. p. 13746. 1. ill. 6 tab. (Comparative experiments carried out in Germany. 50c.

The Electric Locomotive Haulage with Single Phase Current at the Pit. Rosenblumendelle. (Die elektrische Lokomotivfoerderung mit einphasigem Wechselstrom auf der Zeche Rosenblumendelle.) "Bergbau." 1912. 8 p. 93-4. 50c.

Automotor Haulage Incline. Kusch, Karl. (Ein Auto-motorischer Bremsberg.) "Motan-Rdsch." 1912. 6. p. 249-51. 5 fig. (Plant at the Michaeli Colliery, Ostrau-Karwin.) 30c.

IX—SIGNALING

Wireless Telephony in Mines. O. Dobbelstein. (Drahtlose Grubentelephonie.) "Glueckauf." 1912. 40. p. 1623-8. 12 fig. (Description of installation made at the Pit Karolinenglueck, Bochum, for the purpose of determining the possibility of using wireless telephony in mines.) 75c.

Wireless Telephony in Mines. E. P. Buffet. "Coal Age." vol. 2. 19. p. 646-8. 3 fig.

Electric System Signal, Argonaut Mine. R. S. Rainsford. "Eng. Min. Jl." vol. 94. 17. p. 783-4. 4 fig.

X—LIGHTING

Prize Competition for Safety Lamps. (Preisaus-schreiben fuer Sichereitslampen.) "Stahl-Eisen." 1912. 43. p. 1791-2. 70c.

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The Safety Lamp for Gaseous Mines. A. Rzehulsa. (Die Sicherheitslamps fuer Schlagwettergruben.) "Stein Braunkohle." 1912. 19-20. p. 233-7. 35c.

XI—VENTILATION

Ventilation of a Bituminous Coal Mine. G. W. Hamilton. "El. Jl." vol. 9. 11. p. 10,325. 1 fig. 1 tab. (A note is made that while there are set rules for the volume of air required, the application of the rules must depend on present conditions and the plan of future developments.)

Facts and Theories Relating to Mine Fans. D. M. Mowat. "Trans. Min. Inst. Scot." vol. 35. 1. p. 26-36. 1 double plate. $1.50.

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The Mining Disaster at the Pit Lothringen. (Das Grubenunglueck auf Zeche Lothringen.) "Bergbau." 1912. 41. p. 575-7. 50c.

XV—RESCUE AND AMBULANCE

Compressed Oxygen Rescue Helmets. "Coal Age." vol. 2. 18. p. 609-12. 5 fig. (A self-contained breathing apparatus and the use of the pulmotor.)

XVI—PREPARATION

Preparation of Anthracite Coal. S. V. Tench, "Coal Age." vol. 2. 20. p. 681-2. 1 tab. (The preparation of anthracite and the electrical bonding in mining with data on the loss of efficiency through inadequate bonding and means to overcome it.)

Coal Washing and Briquetting. "Mines Min." vol. 33, 4. p. 193-6. 12 fig. (The plant of the Alstaden Colliery, designed to handle anthracite coal.)

Sizing and Sorting Coal in England. "Coal Age." vol. 2. 21. p. 712-3. 2 fig. (A typical plant is described; the coal being traced through the operations of dumping, screening, picking, etc.)

The Design of Coal Screens. B. Shubart. "Coal Age." vol. 2. 21. p. 709-10. 5 fig.

Commercial Sampling of Coal. C. E. Scott. "Mines Min." vol. 33. 4. p. 199-201. 1 fig. 1 tab. (Precautions necessary that the sample may accurately represent the lot when selling by analysis.)

XVII—BRIQUETTES

Briquetting Tests at the United States Fuel Testing Plant, Norfolk, Virginia, 1907-8. C. L. Wright. (U. S. Bur. of Mines.) 8 vo. 42. p. 9 plates. 1912.

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FLOYD W. PARSONS, *Editor.*

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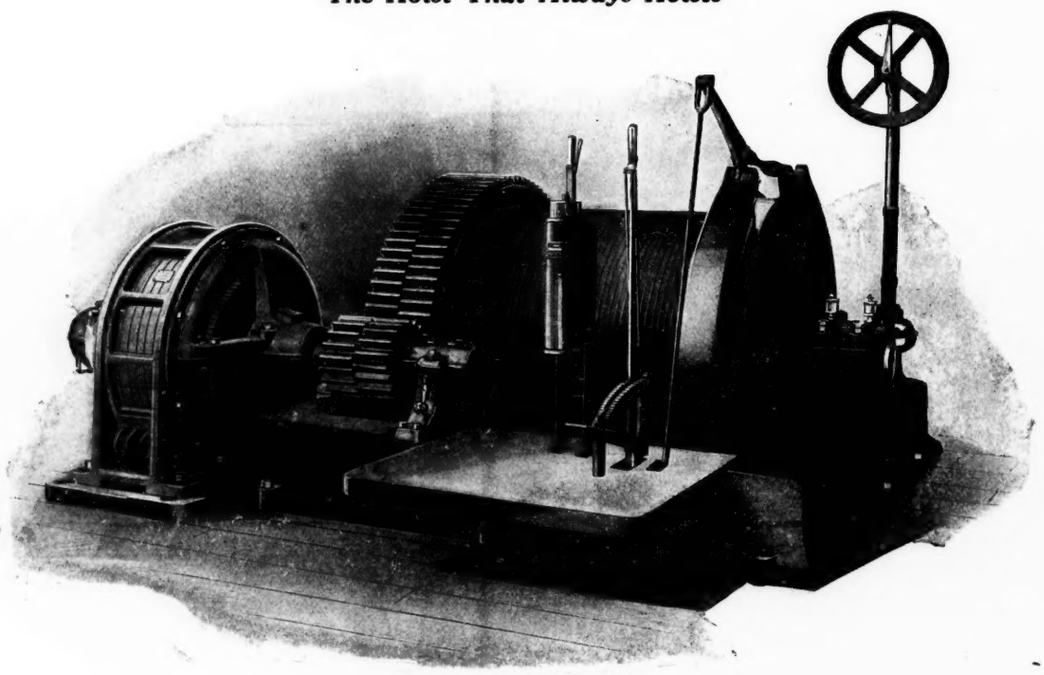

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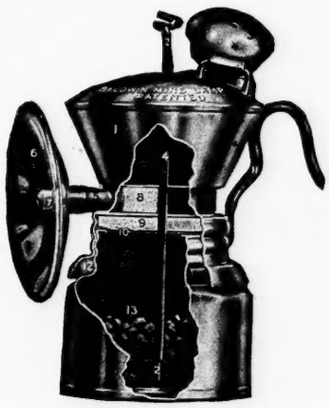

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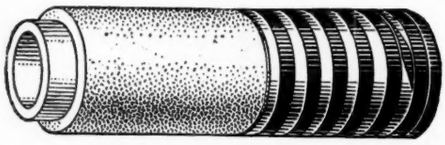

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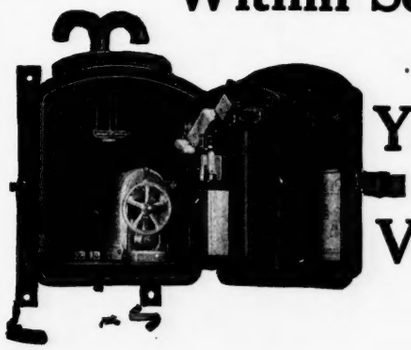

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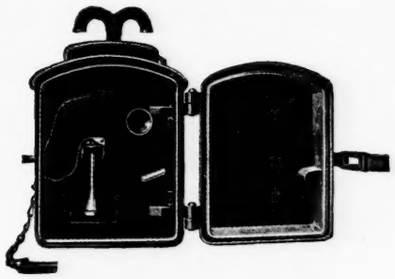

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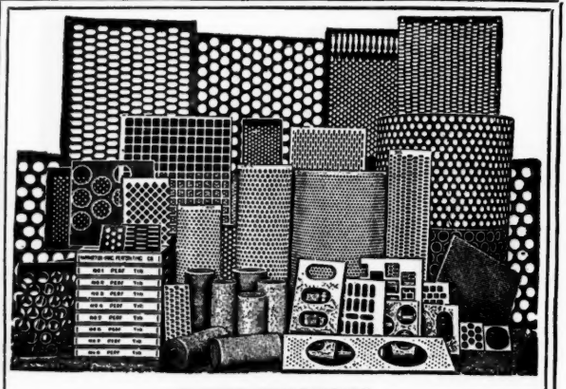

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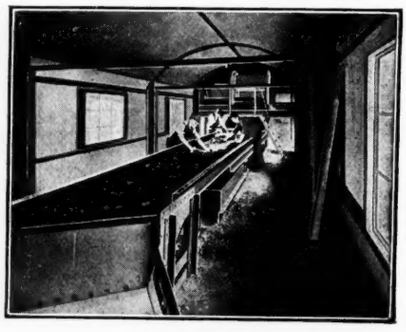

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